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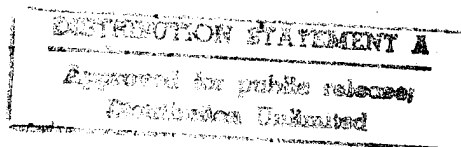
**United States Air Force  
611th Civil Engineer Squadron**

**Elmendorf AFB, Alaska**

**Final**

**Remedial Investigation Report  
Galena Airport and Campion Air Station**

**Volume 6—Appendix C - G**



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**March 1996**

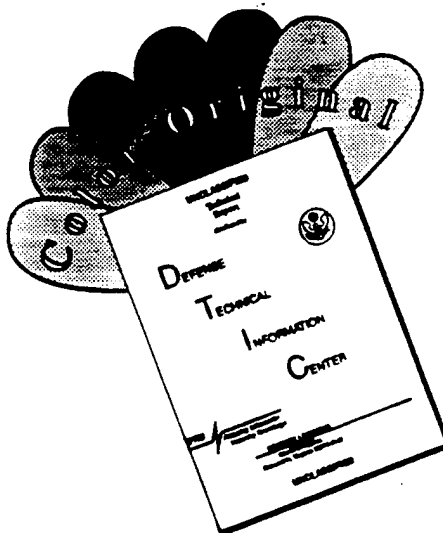
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**APPENDIX C**

**Regulatory Discussion**



**Applicable or Relevant and Appropriate Requirements (ARARs)**

**APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS  
(ARARs)**

In 1980, Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Section 9601 *et seq.*, establishing the Superfund program to address remediation of NPL sites. The regulations adopted by the U.S. Environmental Protection Agency (USEPA) that implement this program are found in 40 *Code of Federal Regulations* (CFR) Part 300, also known as the National Contingency Plan (NCP). CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 which mandated that the level or standard of control specified in a remedial action at NPL sites for the site-specific pollutants be "at least that of any applicable or relevant and appropriate (ARAR) standard, requirement, criteria, or limitation under any federal environmental law, or any more stringent standard, requirement, criteria, or limitation promulgated pursuant to a state environmental statute." SARA also established that the requirements of the NCP apply to federal facilities, including their implementation of the Installation Restoration Program (IRP) at each facility.

CERCLA, as amended by SARA, requires that federal facility remedial actions (for NPL as well as IRP sites) comply with requirements or standards under federal and state environmental laws. Therefore, ARARs are pertinent to Galena and Campion. The 1990 NCP incorporates the new statutory requirement that actions at any remedial sites at this facility must comply not only with ARARs under federal laws, but also with promulgated standards, requirements, criteria, or limitations under state environmental or facility siting laws that are more stringent than corresponding federal standards. "Promulgated" state requirements are those laws or regulations that are of general applicability and are legally enforceable. In terms of state ARARs, only those promulgated standards that are (1) identified by the state in a timely manner; and (2) more stringent than federal requirements may be ARARs.

The terms "applicable" and "relevant and appropriate" are defined as follows:

**"Applicable"** requirements, as defined at 40 CFR Section 300.4, are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Applicable requirements are those that would be legally applicable if the remedial action had not been taken under CERCLA; the concept requires that all jurisdictional prerequisites and criteria of the particular statute have been met.

**"Relevant and appropriate"** requirements, as defined in 40 CFR Section 300.4, are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting law that, while not applicable (as defined above), address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well-suited to the particular site.

The preliminary ARARs described herein were identified in accordance with *CERCLA Compliance with Other Laws Manual* (USEPA/540/G-89/006 and USEPA/540/G-89/009) and *Guidance for Conducting Remedial Investigations Under CERCLA, Interim Final* (USEPA/540/G-89/004). These ARARs will be reassessed in the future, and expanded or refined as needed. Ultimately, the preferred remedial action alternative will be assessed against the CERCLA cleanup criteria, including attainment of, or compliance with, ARARs. This preliminary ARAR identification is divided into three categories of ARARs: 1) ambient or "chemical-specific" requirements; 2) locational standards; and 3) performance, design, or other "action-specific" requirements.

## 1.1

### To Be Considered

Criteria, advisories or guidance documents that do not meet the definition of ARARs but may assist in determining what is necessary to be protective or otherwise useful in developing Superfund remedies are described as information "to-be-considered" (TBC). Three general categories of TBC information are: (1) health effects information with a high degree of credibility, i.e., reference doses; (2) technical information on how to perform or evaluate site investigations or response actions; and (3) policy, i.e., USEPA's groundwater policy. The 1990 amendments to the NCP emphasize that TBC information is to be used on an "as appropriate" basis and is intended to complement the use of ARARs, not be in competition with ARARs.

## **2.0**

## **CHEMICAL-SPECIFIC ARARs**

Chemical-specific ARARs are typically health-based or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the environment (soil, groundwater, surface water, or air) as a result of the remedial action. Potential federal and state chemical-specific ARARs for Galena Airport and Campion Air Force Station are summarized in the following subsections.

### **2.1**

### **Federal Groundwater Protection Standards**

#### **Citations:**

40 CFR Part 264

#### **Discussion:**

The Resource Conservation and Recovery Act (RCRA) sets forth the maximum concentrations for constituents for groundwater protection in 40 CFR Part 264, Subpart F. Table 2-1 lists these maximum concentrations which are relevant and appropriate.

**Table 2-1****RCRA Subpart F Maximum Concentration of Constituents for  
Groundwater Protection**

Constituent	Maximum Concentration (mg/L)
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05
Endrin (1,2,3,4,10,10,10-hexachloro-1,7-epoxy-1,4,4a,5,6,7,8,9a-octahydro-1, 4-endo, endo-5,8-dimethano naphthalene	0.0002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer	0.004
Methoxychlor (1,1,1-Trichloro-2,2-bis (p-methoxyphenylethane)	0.1
Toxaphene (C <sub>10</sub> H <sub>10</sub> Cl <sub>6</sub> , Technical chlorinated camphene, 67-69 percent chlorine)	0.005
2,4-D (2,4-Dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-Trichlorophenoxypropionic acid)	0.01

**Drinking Water Standards****Citations:**

40 CFR Part 141  
18 AAC Chapter 80

**Discussion:**

The National Primary Drinking Water Regulations establish Maximum Contaminant Levels (MCLs) which are enforceable standards under the Safe Drinking Water Act for specific contaminants in public water supplies. Drinking water standards are relevant and appropriate for establishing cleanup levels for groundwater even if it is not currently a drinking water source. Maximum Contaminant Level Goals (MCLGs) are non-enforceable goals on which MCLs are based. Groundwater restoration levels are based on MCLs and MCLGs.

Table 2-2 presents a side by side comparison of the published federal MCLs, State of Alaska MCLs, national and state secondary drinking water standards, and national MCLGs.

Table 2-2

## National and Alaska State Drinking Water Standards

Contaminants	National Primary MCLs <sup>a</sup> (mg/L)	Alaska Primary MCLs <sup>b</sup> (mg/L)	National and State Secondary MCLs <sup>c</sup> (mg/L)	National MCLGs <sup>d</sup> (mg/L)
<b>Organics <sup>e</sup></b>				
Benzene	0.005	0.005	--	zero
Benzo[a]pyrene		0.0002		
Carbon Tetrachloride		0.005		
Chloroform	0.1	--	--	--
o-Dichlorobenzene		0.6		
p-Dichlorobenzene		0.075		
Dichloromethane	0.005 <sup>f</sup>	0.005	--	zero
Di(2-ethylhexyl)adipate		0.4		
Di(2-ethylhexyl)phthalate	0.006 <sup>f</sup>	0.006	--	zero <sup>f</sup>
1,2-Dichloroethane	0.005	0.005	--	--
1,1-Dichloroethene		0.007		
cis-1,2-Dichloroethene	--	0.07	--	--
trans-1,2-Dichloroethene	--	0.1	--	--
1,2-Dichloropropane		0.005		
Ethylbenzene	0.7	0.7	--	0.7
Hexachlorobenzene		0.001		
Hexachlorocyclopentadiene		0.05		
Monochlorobenzene		0.1		
Polychlorinated Biphenyls		0.0005		
Styrene		0.1		
2,3,7,8-TCDD (Dioxin)		3 x 10 <sup>-8</sup>		
Tetrachloroethylene	0.005	0.005	--	zero
Toluene	1	1	--	1
1,2,4-Trichlorobenzene		0.07		
1,1,1-Trichloroethane	0.2	0.2	--	0.20
1,1,2-Trichloroethane	0.2 <sup>f</sup>	0.005	--	0.003 <sup>f</sup>
Trichloroethylene	0.005	0.005	--	zero
Vinyl Chloride		0.002		
Xylenes (total)	10	10	--	10
<b>Inorganics</b>				
Aluminum	--	--	0.2	--
Antimony	0.006 <sup>f</sup>	0.006	--	0.006 <sup>f</sup>
Arsenic	0.05 <sup>h</sup>	0.05	--	--
Barium	1 <sup>h</sup> , 2 <sup>e</sup>	2	--	2 <sup>e</sup>
Beryllium	0.004 <sup>f</sup>	0.004	--	0.004 <sup>f</sup>



**Table 2-2**  
**(Continued)**

Contaminants	National Primary MCLs <sup>a</sup> (mg/L)	Alaska Primary MCLs <sup>a</sup> (mg/L)	National and State Secondary MCLs <sup>a</sup> (mg/L)	National MCLGs <sup>a</sup> (mg/L)
Cadmium	0.005	0.005	--	0.005
Chloride	--	--	250	--
Chromium	0.1	0.1	--	0.1
Copper	1.3 <sup>h</sup>	--	1.0	1.3
Cyanide (as free Cyanide)	0.2 <sup>f</sup>	0.2	--	0.2 <sup>f</sup>
Fluoride	4.0	4.0	2.0	4.0
Iron	--	--	0.3	--
Lead	.015 <sup>h</sup>	0.05 <sup>j</sup>	--	zero
Manganese	--	--	0.05	--
Mercury	0.002	0.002	--	0.002
Nickel	0.1 <sup>f</sup>	0.1	--	0.1 <sup>f</sup>
Nitrate (as Nitrogen)	10	10	--	10
Nitrite (as Nitrogen)	1	1	--	1
Total Nitrate and Nitrite (as Nitrogen)	10	10	--	10
Selenium	0.05	0.05	--	0.05
Silver	0.05 <sup>h</sup>	--	0.1	--
Sodium			250	
Sulfate	--	--	250	--
TDS (total dissolved solids)	--	--	500	--
Thallium	0.002 <sup>f</sup>	0.002	--	0.0005 <sup>f</sup>
Zinc	--	--	5	--
<b>Organic Pesticides</b>				
		--	--	--

<sup>a</sup> From 40 CFR, Section 141.61 for organics and Section 141.62 for inorganics (effective 30 July 1992, unless otherwise noted).

<sup>b</sup> From 18 AAC 80.070, Alaska Register 118, July 1991.

<sup>c</sup> From 40 CFR Section 143.3 (effective 30 July 1992, unless otherwise noted).

<sup>d</sup> From 40 CFR Section 141.50 for organics and Section 141.51 for inorganics (effective 30 July 1992, unless otherwise noted).

<sup>e</sup> Effective 1 January 1993.

<sup>f</sup> Effective 17 January 1994.

<sup>g</sup> Effective 17 August 1992.

<sup>h</sup> From 40 CFR, Section 141.11 for inorganics and Section 141.12 for organics (effective 1 July 1991); however, the lead level is effective only until 7 December 1992). There is no longer an MCL for lead or copper (56 Federal Register 26460, June 7, 1991); however, there is an action level of 0.015 mg/L for lead and 1.3 mg/L for copper.

<sup>i</sup> Applies only to community water systems which serve a population of 10,000 or more that have a disinfectant added to the water.

<sup>j</sup> The Alaska Department of Environmental Conservation expects to amend its regulations in March 1993 to reflect the federal action level for lead of 0.015 mg/L and 1.3 mg/L for copper.

-- MCL or MCLG not specified.

**Citations:**

40 CFR Part 131  
18 AAC Chapter 70  
18 AAC Chapter 80  
USEPA Quality Criteria for Water, 1991

**Discussion:**

A water quality standard defines the water quality goals of a water body by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. States adopt water quality standards to protect public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act. The State of Alaska Water Quality Standards (found at 18 AAC Chapter 70) identify desired uses for water in the state (i.e., recreational, drinking water) and establish in-stream criteria for organic and inorganic constituents which are deemed necessary for the protection of the designated uses of that waterbody. Protected water classes applicable to the Yukon River include:

- A) Water Supply
  - i) drinking, culinary, and food processing;
  - ii) agriculture, including irrigation and stock watering;
  - iii) aquaculture, and
  - iv) industrial;
- B) Water Recreation
  - i) contact recreation
  - ii) secondary recreation
- C) Growth and propagation of fish, shellfish and other aquatic life and wildlife.

The state's promulgated surface water quality standards are presented in Table 2-3 and are legally applicable. The State of Alaska Water Quality Standards apply to groundwater as well as surface water (see 18 AAC 70.110(46) and AS 46.03.900(35).

The USEPA has also developed ambient surface water quality criteria (SWQC) for the protection of aquatic life, which are found in *Quality Criteria for Water* (May 1991) and are legally applicable to cleanup activities. These federal SWQC establish acceptable in-stream concentrations of pollutants for the protection of aquatic life, as set forth in Table 2-4.

**Table 2-3**

**Alaska Surface Water Quality Standards**

Freshwater Uses	Dissolved Inorganic Substances
Water Supply (drinking, culinary, and food processing)	Total dissolved solids (TDS) from all sources shall not exceed 500 mg/L. Neither chlorides nor sulfates shall exceed 200 mg/L.
Water Supply (agriculture, including irrigation and stock watering)	TDS shall not exceed 1,000 mg/L, sodium absorption ratio less than 2.5, sodium percentage less than 60 percent, residual carbonate less than 1.25 mg/L, and boron less than 0.03 mg/L.
Water Recreation (contact recreation)	Not Applicable
Water Recreation (secondary recreation)	Not Applicable
Growth and Propagation of Fish, Shellfish other Aquatic Life and Wildlife	TDS shall not exceed a maximum of 1,500 mg/L, including natural conditions. Increase in TDS shall not exceed one-third of the concentration of the natural condition of the body of water.
Freshwater Uses	Petroleum Hydrocarbons, Oil and Grease
Water Supply (drinking, culinary, and food processing)	Shall not cause a visible sheen upon the surface of the water. Shall not exceed concentrations which individually or in combination impart odor or taste as determined by organoleptic test.
Water Supply (agriculture, including irrigation and stock watering)	Shall not cause a visible sheen upon the surface of the water.
Water Recreation (contact recreation)	Shall not cause a film, sheen, or discoloration on the surface or floor of the water body or adjoining shorelines. Surface waters shall be virtually free from floating oils.
Water Recreation (secondary recreation)	Shall not cause film, sheen, or discoloration on the surface or floor of the water body or adjoining shorelines. Surface waters shall be virtually free from floating oils.
Growth and Propagation of Fish, Shellfish other Aquatic Life and Wildlife	Total hydrocarbons in the water column shall not exceed 15 µg/L, or 0.01 times the lowest measured continuous flow 96 hour LC <sub>50</sub> for life stages of species identified by the department as the most sensitive, biologically important species in a particular location, whichever concentration is less (see notes 8 and 9). Total aromatic hydrocarbons in the water column shall not exceed 10 µg/L, or 0.01 times the lowest measured continuous flow 96 hour LC <sub>50</sub> for life stages of species identified by the department as the most sensitive, biologically important species in a particular location, whichever concentration is less (see notes 9 and 10). Concentrations of hydrocarbons, animal fats, or vegetable oils in the sediment shall not cause deleterious effects to aquatic life. Shall not cause a film, sheen, or discoloration on the surface or floor of the water body or adjoining shorelines. Surface waters shall be virtually free from floating oils.

Table 2-3

(Continued)

Freshwater Uses	Toxic and Other Deleterious Organic and Inorganic Substances
Water Supply (drinking, culinary, and food processing)	Substances shall not exceed <u>Alaska Drinking Water Standards</u> (18 AAC Ch. 80) or USEPA <u>Quality Criteria for Water</u> as applicable to substance.
Water Supply (agriculture, including irrigation and stock watering)	Same as where contact with a product destined for subsequent human consumption is present. Same as Growth and Propagation of Fish, Shellfish Other Aquatic Life and Wildlife or Federal Water Pollution Control Administration, <u>Water Quality Criteria (WQC/FWPCA)</u> as applicable to substances for stockwaters; concentrations for irrigation waters shall not exceed <u>WQC/FWPCA</u> or <u>WQC 1972</u> .
Water Recreation (contact recreation)	Substances shall not exceed Alaska Drinking Water Standards (18 AAC Ch. 80) or USEPA Quality Criteria for Water as applicable to substance.
Water Recreation (secondary recreation)	Substances shall not be present which pose hazards to incidental human contact.
Growth and Propagation of Fish, Shellfish other Aquatic Life and Wildlife	Substances shall not individually or in combination exceed 0.01 times the lowest measured 96 hour LC <sub>50</sub> for life stages of species identified by the department as being the most sensitive, biologically important to the location, or exceed criteria cited in USEPA <u>Quality Criteria for Water</u> or <u>Alaska Drinking Water Standards</u> (18 AAC Ch. 80), whichever concentration is less. Substances shall not be present at or exceed concentrations which individually or in combination impart undesirable odor or taste to fish or other aquatic organisms as determined by either bioassay or organoleptic tests.

Source: 18 AAC Chapter 70

**Table 2-4**

**Federal Surface Water Quality Criteria**

Chemical	Freshwater SWQC	
	Acute (µg/L)	Chronic (µg/L)
<b>METALS</b>		
Aluminum	ND	ND
Antimony	88	30
Arsenic	360 <sup>c</sup>	190 <sup>c</sup>
Barium	ND	ND
Beryllium	130 <sup>a</sup>	5.3 <sup>a</sup>
Cadmium	3.9+	1.1+
Calcium	ND	ND
Chromium (total)	1,700+ <sup>b</sup>	210+ <sup>b</sup>
Cobalt	ND	ND
Copper	9.2+	6.5+
Iron	ND	ND
Lead	82+	3.2+
Magnesium	ND	ND
Manganese	ND	ND
Mercury	2.4	0.012
Molybdenum	ND	ND
Nickel	1,400+	160+ <sup>b</sup>
Potassium	ND	ND
Selenium	20	5
Silver	0.92	0.12 <sup>a</sup>
Sodium	ND	ND
Tin	--	--
Thallium	1,400 <sup>a,b</sup>	40 <sup>a,b</sup>
Vanadium	ND	ND
Zinc	120+	110+
<b>ORGANOCHLORINE PESTICIDES</b>		
alpha-BHC	100	ND
delta-BHC	100	ND
<b>VOLATILE ORGANICS</b>		
Acetone	ND	ND
Benzene	5300 <sup>a</sup>	ND

**Table 2-4**  
**(Continued)**

Chemical	Freshwater SWQC	
	Acute (µg/L)	Chronic (µg/L)
<b>VOLATILE ORGANICS (continued)</b>		
Bromodichloromethane	11000 <sup>a</sup>	ND
Carbon disulfide	ND	2
Carbon tetrachloride	35,200 <sup>a</sup>	ND
Chlorobenzene	250 <sup>a</sup>	50 <sup>a</sup>
Chloroform	28900 <sup>a</sup>	1240 <sup>a</sup>
1,2-Dichloroethane	118000 <sup>a</sup>	20000 <sup>a</sup>
1,1-Dichloroethane	ND	ND
1,2-Dichloroethene	ND	ND
trans-1,2-Dichloroethene	11600 <sup>a</sup>	ND
Ethyl benzene	32000 <sup>a</sup>	ND
4-Methyl-2-pentanone	ND	ND
Methylene chloride	11000 <sup>a</sup>	ND
1,1,1,2-Tetrachloroethane	9.32e+03	ND
1,1,2,2-Tetrachloroethane	9.32e+03	2400 <sup>a</sup>
Tetrachloroethene	ND	ND
Toluene	17500 <sup>a</sup>	ND
1,1,1-Trichloroethane	18000 <sup>a</sup>	ND
1,1,2-Trichloroethane	18000 <sup>a</sup>	9400 <sup>a</sup>
Trichloroethene	45000 <sup>a</sup>	21900 <sup>a</sup>
Trichlorofluoromethane	11000 <sup>a</sup>	ND
Xylenes (total)	ND	ND
<b>SEMIVOLATILE ORGANICS</b>		
Acenaphthene	d	d
Aniline	e	e
Anthracene	ND	ND
Benzo(a)anthracene	ND	ND
Benzo(a)pyrene	ND	ND
Benzo(b)fluoranthene	ND	ND
Benzo(k)fluoranthene	ND	ND
Butylbenzylphthalate	940 <sup>a</sup>	3 <sup>a</sup>
Chrysene	ND	ND

**Table 2-4**  
**(Continued)**

Chemical	Freshwater SWQC	
	Acute ( $\mu\text{g/L}$ )	Chronic ( $\mu\text{g/L}$ )
<b>SEMIVOLATILE ORGANICS (continued)</b>		
Di-n-butylphthalate	940 <sup>a</sup>	3 <sup>a</sup>
Dibenz(a,h)anthracene	ND	ND
Dibenzofuran	ND	ND
2,4-Dimethylphenol	<sup>e</sup>	<sup>e</sup>
bis(2-ethylhexyl)phthalate	400	360
Fluoranthene	3980	ND
2-Hexanone	ND	ND
2-Methylnaphthalene	--	--
2-Methylphenol	--	--
Naphthalene	2300	620
Phenanthrene	30	6.3
Phenol	10200 <sup>a</sup>	2560 <sup>a</sup>
Pyrene	ND	ND
<b>GENERAL</b>		
Cyanide	22	5.2
Total Organic Carbon	--	--

Source: USEPA Quality Criteria for Water, May 1991, unless otherwise noted.

Notes:

<sup>a</sup> Lowest effect concentration, criteria not available.

<sup>b</sup> U.S. Environmental Protection Agency (EPA), 1991c. "Amendments to The Water Quality Standards Regulation to Establish the Numeric Criteria for Priority Toxic Pollutants Necessary to Bring All States into Compliance with Section 303(c)(2)(B); Proposed Rule. Federal Register 56223, Tuesday, November 19, 1991.

<sup>c</sup> Proposed criteria.

<sup>d</sup> (Total NH<sub>3</sub>) pH and temperature dependant.

<sup>e</sup> Draft Water Quality Criteria for these parameters to be proposed March 25, 1994.

HBL Health-Based Level

ND No data available.

U Under review.

-- Not available.

+ Hardness dependent criteria (100 mg/l used).



**Citations:**

40 CFR Part 264, Subpart S, Section 264.521  
(proposed July 27, 1990, 55 Federal Register 30798 *et seq.*)

**Discussion:**

The proposed RCRA corrective action Subpart S regulations contain methodology and criteria for calculating action levels for contaminants in soil, water, and air. Action levels are not cleanup standards; rather, an exceedence of a media action level potentially triggers the need for a corrective measures study (CMS) of a solid waste management unit (SWMU). RCRA Subpart S action levels are presented in Attachment A for all constituents for which Subpart S action levels have been calculated as of April 1994. The USEPA has estimated health-based risk assessment reference doses (RfDs) and carcinogenic slope factors (CSFs) used in the calculation of the action levels. The most recent updates of these factors can be obtained from "The Electronic Handbook of Risk Assessment Values" (Electronic Handbook Publishers, Bellvue, WA, January 6, 1994).

Standard EPA action levels are calculated using methodologies outlined in the preamble to the proposed Subpart S rule, 55 Federal Register 30798-30873. The proposed Subpart S rule provides recommended exposure assumptions and governing equations for calculating action levels.

EPA Region III has developed its own methodology for calculation of "Risk Based Concentrations" RBCs which are used to assess cleanup needs (see Attachment B). The methodology for calculation of RBCs is analogous to that used for EPA's action levels, except that the effects of ingestion and inhalation of toxics are summed to calculate RBCs for water. Table 2-5 provides a complete list of those compounds for which RBCs can be calculated using

the data available in the most current *Electronic Handbook of Risk Assessment Values* and the USEPA Region III methodology.

Action levels calculated using the methodology proposed in Subpart S are to be considered as points of departure for setting cleanup standards. RCRA corrective action cleanup standards (media protection standards) (discussed in Section 2.5) are established at the CMS stage and may be less stringent than the action levels depending on the site conditions.

Since the RCRA Subpart S rules have not been promulgated, the media action levels are "to be considered" (TBC) information only.

## **2.5      USEPA RCRA Proposed Corrective Action Media Protection (Cleanup) Standards**

### **Citations:**

40 CFR Part 264, Subpart S, Section 264.525(d)  
(proposed July 27, 1990, 55 Federal Register 30798 *et seq.*)

### **Discussion:**

Media cleanup standards are contaminant concentrations that must be achieved by the remedial action under the RCRA corrective action program. Media cleanup standards must (1) ensure protection of human health and the environment; (2) be set for each medium of concern during the remedy selection process; and (3) be met at the "point of compliance" specified in Section 264.525(e) of Subpart S. The USEPA is proposing to set media cleanup standards within the overall context of the remedy selection process. Media cleanup standards, since they are also still in proposal stage, are TBC information.

## 2.6

### Alaska Oil and Hazardous Substances Pollution Control Regulations

#### **Citations:**

46 Alaska Statutes Chapter 4, Chapter 9  
AS 46.09  
18 AAC Chapter 75

#### **Discussion:**

The Alaska Oil Pollution Control Law governs the discharge of oil and any necessary cleanup requirements. Pursuant to this law, the Alaska Oil and Hazardous Substances Control Regulations set forth the criteria and standards for discharges of oil and hazardous substances. These regulations include discharge reporting, cleanup, and disposal requirements as well as a schedule of civil penalties for violations. The Akzo Coatings (949 F.2d 1442) court decision clarified that "general requirements containing no specific numerical standards...can be enforceable ARARs". The *Alaska Oil and Hazardous Substance Pollution Control* regulations are legally applicable to cleanup activities.

## 2.7

### Underground Storage Tank Regulations

#### **Citations:**

40 CFR Part 280  
18 AAC Chapter 78

#### **Discussion:**

The Alaska Underground Storage Tank Regulations are promulgated standards for owners and operators of RCRA-regulated underground storage tanks (USTs). Soil cleanup goals associated with corrective action at regulated UST sites are addressed in 18 AAC

78.315. Cleanup goals will be determined by using Table 2-5, the "Guidance for Using Alaska Cleanup Matrix", which is copied from the "Guidance Manual for Underground Storage Tank Regulations 18 AAC 78" (June 18, 1991). The instructions for applying the matrix score sheet are also included in this guidance manual. These standards are enforceable ARARs that depend on site conditions, and are applicable to cleanup activities. There are no cleanup levels in the federal UST regulations.

## **2.8            Alaska Solid Waste Management Regulations**

### **Citations:**

18 AAC Chapter 60

### **Discussion:**

The Alaska Solid Waste Management Regulations set forth standards for solid waste disposal facilities, including accumulation and storage limitations, landspreading restrictions, and requirements for special waste disposal. Permitting standards as well as monitoring and reporting requirements are set forth in these regulations. Additional state regulations for solid waste disposal facilities are currently being drafted by DEC, and will be sent out for proposal in late 1994. These standards are relevant and appropriate to remediation activities.

**Table 2-5**

**Guidance for Using Alaska Cleanup Matrix  
(UST and Non-UST Soil)**

I. Matrix Score Sheet					
1. Depth to Subsurface Water					
< 5 feet		(10)			
5 - 15 feet		(8)			
15 - 25 feet		(6)			
25 - 50 feet		(4)			
> 50 feet		(1)			
2. Mean Annual Precipitation					
> 40 inches		(10)			
25 - 40 inches		(5)			
15 - 25 inches		(3)			
< 15 inches		(1)			
3. Soil Type (Unified Soil Classification)					
Clean, coarse-grained soils		(10)			
Coarse-grained soils with fines		(8)			
Fine-grained soils (low OC)		(3)			
Fine-grained soils (high OC)		(1)			
4. Potential Receptors					
Public Well within 1000 feet, or Private Well(s) within 500 feet		(15)			
Municipal/private well within 1/2 mile		(12)			
Municipal/private well within 1 mile		(8)			
No known well within 1/2 mile		(6)			
No known well within 1 mile		(4)			
Non-potable groundwater		(1)			
5. Volume of Contaminated Soil					
> 500 cubic yards		(10)			
100 - 500 cubic yards		(8)			
25 - 100 cubic yards		(5)			
>De Minimis - 25 cubic yards		(2)			
De Minimis		(0)			
Matrix Score		Cleanup Level in mg/kg			
		Diesel	Gasoline/Unknown		
		diesel range pet. hydro.	gasoline range pet. hydro.	Benzene	BTEX
Level A	>40	100	50	0.1	10
Level B	27-40	200	100	0.5	15
Level C	21-26	1000	500	0.5	50
Level D	<20	2000	1000	0.5	100

## 2.9

### Alaska and Federal Hazardous Waste Management Regulations

#### **Citations:**

18 AAC Chapter 62  
40 CFR Part 261  
40 CFR Part 268

#### **Discussion:**

The Alaska Hazardous Waste Management Regulations include the federal RCRA Subtitle C requirements with additional criteria and standards promulgated by the State of Alaska. The state adds requirements regarding: 1) the identification of hazardous waste; 2) reporting requirements for generators and transporters; 3) standards for owners and operators of treatment, storage, disposal facilities; and 4) requirements for hazardous waste delisting petitions. The Federal regulations in 40 CFR Part 261 address the requirements for identification of hazardous wastes, which is critical during any remediation activity that may result in generation of hazardous wastes. Also critical in remediation activities are the land disposal restrictions (a.k.a. "Land Ban"), 40 CFR Part 268, which require treatment standards for certain wastes generated during remedial actions. Both the state and federal rules are legally applicable to cleanup activities at this facility.

## 2.10

### Alaska Guidance on Surface and Groundwater Cleanup Levels

#### **Citation:**

Alaska Department of Environmental Conservation Guidance

## **Discussion:**

The State of Alaska has issued a number of guidance documents and memoranda which provide cleanup levels for various media. Since these guidance documents are not promulgated, they are not ARARs. However, they are TBC information sources. These guidance documents include:

- Alaska Interim Guidance for Surface and Groundwater Cleanup Levels (26 September 1990)--used in the oil and hazardous substance spill program;
- Alaska Guidance Manual for Underground Storage Tank Regulations (18 June 1991);
- Alaska Guidance for Non-UST Soil Cleanup (17 July 1991); and
- Storage, Remediation, and Disposal of Non-UST Petroleum Contaminated Soils (29 July 1991).

Table 2-5, the "Guidance for Using Alaska Cleanup Matrix" is copied from the "Alaska Guidance for Non-UST Soil Cleanup", which also includes instructions for applying the matrix score sheet are included in this guidance document.

### **2.11      Air Standards**

The following air pollution regulations are ARARs, which are relevant and appropriate to cleanup activities:

- AS 46.03 - Water, Air, Energy, and Environmental Conservation;
- 18 AAC 50 - Alaska Air Quality Control Regulations;
- 18 AAC 52 - Alaska Motor Vehicle Emissions Inspection Rules;
- 40 CFR Part 50 - National Primary and Secondary Ambient Air Quality Standards;

- 40 CFR Part 50 - National Primary and Secondary Ambient Air Quality Standards;
- 40 CFR Part 58 - Ambient Air Quality Surveillance;
- 40 Part 60 - Standards of Performance for New Stationary Sources; and
- 40 CFR Part 61 - National Emissions Standards for Hazardous Air Pollutants.

## 2.12 Toxic Substances Control Act (TSCA)

### **Citations:**

40 CFR Part 761  
18 AAC 60

### **Discussion:**

Because PCBs are a constituent of concern, the TSCA regulations are applicable to the management of any confirmed PCB wastes. Wastes containing greater than or equal to 50 ppm PCBs are subject to the TSCA rules at 40 CFR Part 761.

Section 761.65 of these rules allows PCB wastes to be stored on site for up to one year from the date the waste is first placed in storage as long as the TSCA storage facility criteria are met. On-site storage may last for up to 30 days without triggering the TSCA storage facility requirements.

TSCA-regulated PCBs can be disposed of only at TSCA-authorized landfills or incinerated (40 CFR Part 761, Subpart D). Wastes that contain PCBs below 50 ppm are regulated under the Alaska solid waste rules (18 AAC 60).



## **PCB Spill Cleanup**

The US EPA has developed national PCB spill cleanup criteria (40 CFR 761, Subpart G) which establish cleanup requirements linked to the risks posed by the spill and depend on the location and quantity of the spill. Generally, TSCA regulations are only applicable to items containing more than 50 ppm PCBs. Therefore, the US EPA spill cleanup criteria also apply only where the source of the spilled material is greater than 50 ppm PCBs. State of Alaska regulations under 18 AAC 75 provide the state with broad authority to oversee cleanup activities involving PCBs, including sites containing less than 50 ppm PCBs.

The US EPA Spill Policy also applies only to releases occurring after May 4, 1987. Cleanup requirements for releases prior to this date are established on an individual site basis by regional EPA offices and state regulatory authorities.

In general, the US EPA Spill Policy requires that media contaminated by a PCB spill be cleaned up to the same criteria as that established for the source of the spill. This requirement is dependent on the concentration of PCBs associated with the source of the spill, instead of the concentration associated with the contaminated media. For example, if a transformer having a PCB concentration of 600 ppm leaks, it will result in contaminated soil having PCB concentrations ranging from less than 600 ppm down to attenuating levels around 1 ppm. The Spill Policy states that all of the contaminated soil (even that at 1 ppm) requires management as though it contained the same concentration as the source (600 ppm).

In addition to defining management requirements for contaminated media, the Spill Policy also established several high-risk spill scenarios or other scenarios which trigger immediate reporting requirements and may, ultimately, dictate more stringent management requirements.

### **High-Risk Spill Scenarios**

The cleanup of five high risk spill scenarios is addressed on a site-specific basis, though they are still subject to some of the general requirements. These five high-risk spill scenarios are spills to:

- Surface waters;
- Sewers or sewage treatment systems;
- Drinking water sources or distribution systems;
- Animal grazing lands; and
- Vegetable gardens.

In any of these situations, the National Response Center and the EPA Regional Office must be notified if the spill is greater than 10 pounds of PCBs. Also, the spill residue must be disposed of and the spill boundaries must be determined. For the first three cases, the EPA cleanup guidance must be obtained within 24 hours to determine the numerical cleanup level. State of Alaska notification and reporting requirements also apply.

## Other Scenarios

For other scenarios, numerical standards have been set which depend on the location, quantity, and concentration of the spill. Initially, the spill residue should be disposed of and the spill boundary must be determined. If the spill involves more than 10 pounds of PCBs, the National Response Center and the EPA regional office must be contacted. Spills of less than one pound of PCBs and less than 500 ppm must be double washed and rinsed. All contaminated soil must be excavated and backfilled with clean soil.

Spills above 500 ppm in concentration or weighing more than one pound have immediate cleanup requirements. The area must be blocked off and areas of visible contamination should be documented then cleaned. Action should be taken within 24 hours (48 hours for PCB transformers) and the site must be sampled after cleanup. If the area is an electrical substation, solid surfaces must be cleaned to 100  $\mu\text{g}/100\text{ cm}^2$ , and the soil must be cleaned to 25 ppm (or 50 ppm and the area labeled).

If the spill occurs in an unrestricted area, replaceable household items should be disposed of according to 40 CFR § 761.60. All outdoor and indoor surfaces should be cleaned to 10  $\mu\text{g}/100\text{ cm}^2$  and the ground excavated more than 10 inches and to less than 10 ppm.

## 2.13 Other Chemical-Specific ARARs

The following chemical-specific ARARs may potentially be applicable:

- AS 18.45 (Atomic Energy);
- AS 46.03.250--AS 46.03.317 (Radiation and Hazardous Waste Protection);
- 18 AAC 85 (Radiation Protection); and
- AS 46.03.320--AS 46.03.330 (Pesticide Control)  
18 ACC 90.

### **3.0**

#### **LOCATION-SPECIFIC ARARs**

Location-specific ARARs are requirements that affect the management of hazardous constituents, or the units in which they are managed, due to the location of the unit(s). They might be triggered, for example, if groundwater remediation were selected as a remedial action which required the construction of new surface wastewater treatment units. Examples of sensitive locations for such units include wetlands, floodplains, historic areas, and wildlife refuges. Potential federal and state location-specific ARARs are set forth in Table 3-1.

**Table 3-1****Potential Location-Specific ARARs**

<b>Statutory, Regulatory Basis</b>	<b>Citation</b>	<b>Description</b>
Resource Conservation and Recovery Act	40 CFR Sec. 264.18 18 AAC Sec. 60 18 AAC Sec. 63.040	Prohibits or restricts siting of solid and hazardous waste management units in certain sensitive areas (100-year floodplain, active seismic area, wetlands).
Migratory Bird Treaty Act of 1972	16 USC Sec. 703-712 50 CFR Parts 10, 20, 21	If migratory birds are present, provides protection of almost all species of native birds in the U.S. from unregulated activities. Unregulated activities can include poisoning at hazardous waste sites.
Fish and Wildlife Conservation Act of 1980	16 USC Sec. 2901 50 CFR Part 83	Requires the submittal of conservation plans outlining provisions to conserve non-game fish and wildlife. Approved conservation plans are enforced by state agencies.
Federal Land Policy and Management Act	13 USC Sec. 1700 et seq.	Establishes requirements concerning utilization of public lands, particularly rights-of-way regulation, land use planning and land acquisition and appropriation of waters on public lands.
Fish and Wildlife Improvement Act	16 USC Sec. 661-666c	Provides for development, protection, rearing, and stocking of all species of wildlife, wildlife resources, and their habitat.
Endangered Species Act	16 USC 1531 et seq. 50 CFR Part 200 50 CFR Part 402	Provides for protection and conservation of various species of fish, wildlife, and plants.
Clean Water Act, Section 404	33 USC 1251 et seq. Sec. 404 40 CFR Part 230	Prohibits discharge of dredged or fill material into wetlands without a permit.
Fish and Wildlife Improvement Act	33 CFR 320-330	Provides for management of fish and wildlife.
Archaeological and Historic Preservation Act	16 USC Sec. 469 40 CFR 6.301(c)	Establishes procedures for preservation of historical and archaeological resources when terrain is altered as a result of a federal or federally licensed construction activity.
National Historic Preservation Act	16 USC Sec. 470 40 CFR Sec. 6.301(b) 36 CFR Part 800	Provides for the protection of historic places.
Historic Sites, Buildings, and Antiquities Act	16 USC Sec. 461-467	Provides for the protection of natural landmarks.
Alaska Coastal Management Program Law	AS 46.40	Provides for the use, management, restoration, and enhancement of the overall quality of the coastal environment.
Alaska Coastal Management Regulations	6 AAC 80 and 85	Provides for the regulated use of coastal areas and their resources.

**Table 3-1****(Continued)**

<b>Statutory, Regulatory Basis</b>	<b>Citation</b>	<b>Description</b>
Coastal Zone Management Act	16 USC Sec. 1451	Provides for the use, management, restoration, and enhancement of the overall quality of the coastal environment.
Coastal Barrier Resources Act	16 USC 3501	Protects coastal barrier resources.
Alaska Statutes, Title 46	AS 46.03 18 AAC 15 18 AAC 70 18 AAC 72	Environmental Conservation
Alaska Statutes, Title 46	AS 46.04 18 AAC 75	Oil and Hazardous Substance Pollution Control
Alaska Statutes, Title 46	AS 46.09 18 AAC 75	Hazardous Substance Release Control
Alaska Statutes, Title 16	AS 16 5 AAC 95	Alaska Fish and Game Requirements
Alaska Statutes, Title 41	AS 41.35 11 AAC 16	Alaska Historic Preservation Requirements
Alaska Statutes, Title 27	AS 27.19 11 AAC 96 11 AAC 97	Reclamation laws governing mining (includes gravel extraction)
Alaska Statutes, Title 41	AS 41.15 AS 41.17 11 AAC 95	Forest Resources and Practices
Alaska Statutes, Title 41	AS 41.06 11 AAC 84	Geothermal Resources
Alaska Statutes, Title 38 and Title 41	AS 38 AS 41.21 AS 41.23 AAC, Title 11	Activities on state lands (including tidelands and submerged lands)

#### **4.0**

#### **ACTION-SPECIFIC ARARs**

Action-specific ARARs are technology-based or activity-based requirements that may be triggered by the particular remedial activities chosen. Action-specific ARARs do not in themselves determine the remedial alternative, rather they place restrictions on the manner in which a selected alternative may be achieved. Table 4-1 sets forth action-specific ARARs that may be applicable to the remediation activities.



**Table 4-1**

**Potential Action-Specific ARARs**

Standard, Requirement, Criteria, or Limitation	Federal Citation	Description	State Citation
Solid Waste Disposal Act	42 USC Sec. 6901-6987	Resource Conservation and Recovery	AS 46.03 Environmental Conservation
Standards for Underground Injection Requirements	40 CFR Part 147	Require compliance with state underground injection requirements.	AS 31 20 AAC 25
Criteria for Classification of Solid Waste Disposal Facilities and Practices	40 CFR Part 257	Establishes criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment and thereby prohibit open dumps.	18 AAC 62 Alaska Hazardous Waste Regulations 18 AAC 60
Criteria for Municipal Solid Waste Disposal Facilities	40 CFR Part 258	Establishes minimum federal criteria for design, construction, operation, and permitting of municipal solid waste landfills.	18 AAC 60. Additional state regulations will be promulgated after October 1993.
Identification and Listing of Hazardous Waste	40 CFR Part 261	Defines those solid wastes which are subject to regulation as hazardous waste.	18 AAC 62 Alaska Hazardous Waste Regulations
Standards Applicable to Generators of Hazardous Waste	40 CFR Part 262	Establishes standards for generators of hazardous waste	18 AAC 62 Alaska Hazardous Waste Regulations
Standards Applicable to Transporters of Hazardous Waste	40 CFR Part 263	Establishes standards which apply to persons transporting hazardous waste within the U.S.	18 AAC 62 Alaska Hazardous Waste Regulations

Table 4-1

(Continued)

Standard, Requirement, Criteria, or Limitation	Federal Citation	Description	State Citation
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR Part 264	Establishes minimum national standards which define the acceptable management of hazardous waste for owners and operators of facilities which treat, store, or dispose of hazardous waste.	18 AAC 63 18 AAC 62 Alaska Hazardous Waste Regulations AS 46.09 Hazardous Substance Release Control
Standards for Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities	40 CFR Part 266	Establishes requirements which apply to recyclable materials used in a manner constituting disposal or hazardous waste burned for energy recovery.	18 AAC 62 Alaska Hazardous Waste Regulations
Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities	40 CFR Part 267	Establishes minimum national standards that define acceptable management of hazardous waste land disposal facilities.	18 AAC 62 Alaska Hazardous Waste Regulations
Land Disposal Restrictions Program	40 CFR Part 268	Sets treatment standards for hazardous wastes based on the levels achievable by current technology; sets two-year national variances from the statutory effective dates due to insufficient treatment capacity.	18 AAC 62 Alaska Hazardous Waste Regulations
Hazardous Waste Permit Program	40 CFR Part 270	Establishes provisions covering basic EPA permitting requirements.	AAC 62 Alaska Hazardous Waste Regulations
Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (USTs)	40 CFR Part 280	Provides regulations pertaining to underground storage tanks.	18 AAC 78 Alaska Underground Storage Tank Regulations

**Table 4-1**  
**(Continued)**

Standard, Requirement, Criteria, or Limitation	Federal Citation	Description	State Citation
<b>Clean Water Act</b>	33 USC Sec. 1251-1376		
EPA- Administered Permit Programs: The National Pollutant Discharge Elimination System	40 CFR Part 122	Requirements for the discharge of pollutants from any point source into waters of the U.S.	18 AAC 70 Alaska Water Quality Standards
	40 CFR Part 136	Guidelines which establish test procedures for analysis of pollutants.	
	40 CFR Part 403	Sets standards for discharging to an off-site publicly-owned treatment works (POTW).	18 AAC 72 Alaska Wastewater Disposal Regulations
	40 CFR Part 125	Provides discharge criteria, chemical standards, and permit forms for existing industrial operations.	
Criteria and Standards for the National Pollutant Discharge Elimination System			
State of Alaska, Oil Pollution Control Law		Establishes requirements relating to oil, petroleum, and hazardous substance pollution prevention, control, and cleanup.	AS 46.04 18 AAC 75 18 AAC 75.319 18 AAC 75.327 18 AAC 75.337 Alaska Oil and Hazardous Substances Pollution Control Regulations
	29 USC Sec. 657 and 667		AS 18.60
	29 CFR Part 1910	Sets standards for safety in the work environment.	8 AAC 61
	29 CFR Part 1926	Sets standards for safety in the construction work environment.	
<b>Occupational Safety and Health Act of 1970</b>			
Occupational Safety and Health Standards			
Safety and Health Regulations for Construction			

Table 4-1

(Continued)

Standard, Requirement, Criteria, or Limitation	Federal Citation	Description	State Citation
State of Alaska, Fire Protection		Sets standards and requirements for safety and fire protection.	AS 18.70 13 AAC 50 and 18
Safety and Health Standards for Federal Service Contracts	29 CFR Part 1925	States that safety and health standards are applicable to work performed under Federal Service Contracts.	
Clean Air Act	42 USC Sec 7401-7642		
National Emissions Standards for Hazardous Air Pollutants	40 CFR Part 61	Establishes emissions standards for hazardous air pollutants that may reasonably be anticipated to result in an increase in mortality or an increase in serious irreversible, or incapacitating illness.	18 AAC 50 Alaska Air Quality Control Regulations 18 AAC 51 Alaska Administrative Procedure and Permit Regulations
National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Establishes standards for ambient air quality to protect public health and welfare.	18 AAC 50 Alaska Air Quality Control Regulations 18 AAC 51 Alaska Administrative Procedure and Permit Regulations

**Table 4-1**

**(Continued)**

Standard, Requirement, Criteria, or Limitation	Federal Citation	Description	State Citation
<b>Safe Drinking Water Act</b>	40 USC Sec. 300G		
Underground Injection Control Program	40 CFR Part 144	Provides for protection of underground sources of drinking water.	
Underground Injection Control Program: Criteria and Standards	46 CFR Part 146	Provides technical requirements for UIC programs.	AS 31.05 20 AAC 25
<b>Toxic Substances Control Act</b>	15 USC Sec. 2601-2671		
<b>Federal Insecticide, Fungicide, and Rodenticide Act</b>	7 USC Sec. 136-136y		
State of Alaska, Pesticide Control		Establishes standards and requirements for pesticide control.	AS 46.03.320 through 46.03.330 18 AAC 90
<b>State of Alaska, Appropriation of Water</b>		Establishes requirements concerning appropriation of water.	AS 46.15 11 AAC 93

**Attachment A**

**RCRA Subpart S Action Levels**

Sub Part S Action Levels - April 15, 1994															
Chemical	CAS #	Oral RfD mg/kg-d	Inh RfC mg/m3	Wt. of Evid.	Oral SF (mg/kg-d)-1	Inh. Unit Risk (ug/m3)-1	Soil Action Levels non carc. mg/kg	carc. mg/kg	Air Action Level non car ug/m3	carc. ug/m3	Water Action Level non carc. mg/L	carc. mg/L	MCL mg/L	AWQC - FW Acute ug/L	Chronic ug/L
acenaphthene	83-32-9	0.08		NA				4800			2.1				
acenaphthylene	208-96-8			D											
acephate	30560-19-1	0.004		C	0.0087	2.2E-08		320	804.598		0.14	0.04023			
acetaldehyde	75-07-0		0.009	B2					9	0.4545					
acetate, ethyl	141-78-6	0.9		NA			72000				31.5				
acetic acid, 2,4,5-trichlorophenoxy	93-78-5	0.01		NA			800				0.35				
acetochlor	34256-82-1	0.02		NA			1600				0.7				
acetone	67-64-1	0.1		D			8000				3.5				
acetone cyanohydrin	75-86-5	0.07	0.01	NA			5600		10		2.45				
acetonitrile	75-05-8	0.006	0.05	NA			480		50		0.21				
acetophenone	98-86-2	0.1		D			8000				3.5				
acetyl chloride	75-36-5			D											
acifluorfen, sodium	62476-59-9	0.013		NA			1040				0.455				
acrolein	107-02-8	0.02	2E-05	C			1600		0.02		0.7				
acrylamide	79-06-1	0.0002		B2	4.5	0.0013	16	0.15556		0.0008	0.007	7.8E-06			
acrylate, 2-ethoxyethyl	106-74-1			NA											
acrylate, ethyl	140-88-5			B2	0.048			14.5833				0.00073			
acrylic acid	79-10-7	0.5	0.001	NA			40000		1		17.5				
acrylonitrile	107-13-1		0.002	B1	0.54	0.000068		1.2983	2	0.0147		6.5E-05			
adiponitrile	111-69-3			D											
alachlor	15972-60-8	0.01		B2	0.08		800	8.75			0.35	0.00044	0.002		
alar	1596-84-5	0.15		NA			12000				5.25				
aldicarb	116-06-3	0.0002		D			16				0.007		0.003		
aldicarb sulfone	1846-88-4	0.001		NA			80				0.035		0.003		
aldrin	309-00-2	3E-05		B2	17	0.0049	2.4	0.04118		0.0002	0.00105	2.1E-06		3	
alldochlor	93-71-0			NA											
allyl	74223-64-6	0.25		NA			20000				8.75				
allyl alcohol	107-18-6	0.005		NA			400				0.175				
allyl chloride	107-05-1		0.001	C					1						
aluminum	7429-90-5			NA											
aluminum phosphide	20859-73-8	0.0004		NA			32				0.014				
amdro	67485-29-4	0.0003		NA			24				0.0105				
ametryn	834-12-8	0.009		NA			720				0.315				
amine, n,n-diphenyl	122-39-4	0.025		NA			2000				0.875				
amine, n-nitroso-di-n-butyl	924-16-3			B2	5.4	0.0016		0.12963		0.0006		6.5E-08			
amine, n-nitroso-di-n-propyl	621-64-7			B2	7			0.1				5E-08			
amine, N-nitrosodiphenyl-	86-30-6			B2	0.0049			142.857				0.00714			
amitraz	33089-61-1	0.0025		NA			200				0.0875				
ammonia	7664-41-7		0.1	NA					100						
ammonium acetate	631-61-8			D											
ammonium methacrylate	16325-47-6			D											
ammonium sulfamate	7773-06-0	0.2		NA			16000				7				
aniline	62-53-3		0.001	IRIS	0.0057			122.807	1			0.00614			
aniline hydrochloride, 2,4,6-trichloro	33683-50-2			C	0.029			241.379				0.01207			
aniline hydrochloride, 2,4-dimethyl	21436-96-4			C	0.58			12.069				0.0006			
aniline hydrochloride, 4-chloro-2-methyl	3165-93-3			B2	0.46			1.52174				7.6E-05			
aniline, 2,4,6-trichloro	634-93-5			C	0.034			205.882				0.01029			
aniline, 2,4-dimethyl	95-68-1			C	0.75			9.33333				0.00047			

Sub Part S Action Levels - April 15, 1994															
Chemical	CAS #	Oral RfD mg/kg-d	Inh RfC mg/m3	Wt. of Evid.	Oral SF (mg/kg-d)-1	Inh. Unit Risk (ug/m3)-1	Soil Action Levels non carc. mg/kg	carc. mg/kg	Air Action Level non car ug/m3	carc. ug/m3	Water Action Level non carc. mg/L	carc. mg/L	MCL mg/L	AWQC - FW Acute ug/L	Chronic ug/L
aniline, 2-chloro	95-51-2			NA											
aniline, 3-chloro	108-42-9			NA											
aniline, 4-chloro	108-47-8	0.004		NA				320			0.14				
aniline, 4-chloro-2-methyl	95-69-2			B2	0.58				1.2089				6E-05		
aniline, N,N'-diethyl	91-66-7			NA											
aniline, n,n-dimethyl	121-69-7	0.002		NA				160			0.07				
aniline, N-ethyl	103-69-5			NA											
anisidine, ortho-	90-04-0			NA											
anthracene	120-12-7	0.3		D			24000				10.5				
anthracene, 7,12-dimethyl(benz(a)	57-97-6			NA											
antimony	7440-38-0	0.0004		NA				32			0.014		0.006		
antimony pentoxide	1314-60-9	0.0005		NA			40				0.0175				
antimony potassium tartrate	304-61-0	0.0009		NA			72				0.0315				
antimony tetroxide	1332-81-6	0.0004		NA			32				0.014				
antimony trioxide	1309-64-4	0.0004		NA			32				0.014				
apolo	74115-24-5	0.013		C			1040				0.455				
aramite	140-57-8	0.05		B2	0.025	7.1E-06	4000	28		0.1408	1.75	0.0014			
aroclor 1018	12674-11-2	7E-05		NA			5.6				0.00245			0.014	
aroclor 1248	12672-29-6			NA										0.014	
aroclor 1254	11097-69-1			NA											
arsenic	7440-38-2	0.0003		A		0.0043	24			0.0002	0.0105		0.05	360	190
arsine	7784-42-1		5E-05	NA					0.05						
asbestos	1332-21-4			A											
asutur	76578-14-8	0.009		D			720				0.315		7		
asulam	3337-71-1	0.05		NA			4000				1.75				
atrazine	1912-24-9	0.035		C	0.222		2800	31.5315			1.225	0.00158	0.003		
avermectin b1	85195-55-3	0.0004		NA			32				0.014				
azobenzene	103-33-3			B2	0.11	0.000031		6.36364		0.0323		0.00032			
barium	7440-39-3	0.07	5E-04	NA			5600		0.5		2.45		2		
barium cyanide	542-62-1	0.1		NA			8000				3.5				
baygon	114-26-1	0.004		NA			320				0.14				
bayleton	43121-43-3			NA											
baythroid	68359-37-5			NA											
benefin	1861-40-1	0.3		NA			24000				10.5				
benomyl	17804-35-2	0.05		NA			4000				1.75				
bentazon	25057-89-0	0.0025		NA			200				0.0875				
benzal chloride	98-87-3			NA											
benzaldehyde	100-52-7	0.1		NA			8000				3.5				
benzaldehyde cyanohydrin	532-28-5			NA											
benzene	71-43-2			A	0.029	8.3E-06		24.1379		0.1205		0.00121	0.005		
benzene, 1,2,4-tribromo	615-54-3	0.005		NA			400				0.175				
benzene, 1,2,4-trichloro	120-82-1	0.01	0.009	D			800		9		0.35		0.07		
benzene, 1,2-dinitro	528-29-0	0.0004		D			32				0.014				
benzene, 1,3,5-trinitro	99-35-4	5E-05		NA			4				0.00175				
benzene, 1,3-dinitro	99-65-0	0.0001		D			8				0.0035				
benzene, 1,4-dibromo	106-37-6	0.01		NA			800				0.35				
benzene, 1,4-dinitro	100-25-4	0.0004		NA			32				0.014				
benzene, m-chloronitro	88-73-3			NA											



Sub Part S Action Levels - April 15, 1994														
Chemical	CAS #	Oral RfD mg/kg-d	Inh RfC mg/m3	Wt. of Evid.	Oral SF (mg/kg-d)-1	Inh. Unit Risk (ug/m3)-1	Soil Action Levels non carc. mg/kg	carc. mg/kg	Air Action Levels non car ug/m3	Water Action Level non carc. mg/L	carc. mg/L	MCL mg/L	AWQC - FW Acute ug/L	Chronic ug/L
benzene, p-chloronitro	121-73-3			B2	0.018			38.8889						
benzidine	92-87-5	0.003		A	230	0.067		0.00304		1E-05	0.105	1.5E-07		
benzidine, 3,3'-dimethyl	119-93-7			B2	9.2			0.07609				3.8E-06		
benzidine, 3,3-dimethoxy	119-90-4			B2	0.014			50				0.0025		
benzo(a)anthracene	56-55-3			B2	0.73			0.9589				4.8E-05		
benzo(a)pyrene	50-32-8			B2	7.3			0.09589				4.8E-06	2E-04	
benzo(b)fluoranthene	205-99-2			B2	0.73			0.9589				4.8E-05		
benzo(g,h,i)perylene	191-24-2			D										
benzo(j)fluoranthene	205-82-3			NA										
benzo(k)fluoranthene	207-08-9			B2	0.073			9.58904				0.00048		
benzoic acid	65-85-0	4		D			320000							
benzothiazole, 2-(thiocyanomethylthio)-	21564-17-0	0.03		NA			2400				1.05			
benzotrichloride	98-07-7			B2	13			0.05385				2.7E-06		
benzyl alcohol	100-51-6	0.3		NA			24000				10.5			
benzyl chloride	100-44-7			B2	0.17			4.11765						
beryllium	7440-41-7	0.005		B2	4.3	0.0024	400	0.16279		0.0004	0.175	8.1E-06	0.004	
bidrin	141-66-2	0.0001		NA			8				0.0035			
biphenanthrin	82657-04-3	0.015		NA			1200				0.525			
biphenyl, 1,1-	92-52-4	0.05		D			4000				1.75			
bis(2-chloroethoxy)methane	111-91-1			D										
bisphenol A	80-05-7	0.05		NA			4000				1.75			
boron	7440-42-8	0.09	0.02	NA			7200		20		3.15			
boron trifluoride	7637-07-2		7E-04	NA					0.7					
bromoacetone	598-31-2			NA										
bromochloromethane	74-97-5			D										
bromodichloromethane	75-27-4	0.02		B2	0.06		1600	11.6667			0.7	0.00058	0.1	
bromodifluoromethane	1511-62-2			NA										
bromoform	75-25-2	0.02		B2	0.00793	1.1E-06	1600	88.2724		0.9091	0.7	0.00441	0.1	
bromomethane	74-83-9	0.0014	0.005	D			112		5		0.049			
bromophos	2104-96-3	0.005		NA			400				0.175			
bromotrichloromethane	75-62-7			D										
bromoxynil	1689-84-5	0.02		NA			1600				0.7			
bromoxynil octanoate	1689-99-2	0.02		NA			1600				0.7			
busan 77	31512-74-0			NA										
busan 80	2491-38-5			NA										
butadiene, 1,3-	106-99-0			B2		0.00028				0.0036				
butadiene, 2-chloro-1,3-	126-99-8	0.02	0.007	NA			1600		7		0.7			
butane, 1-chloro	109-69-3	0.4		D			32000				14			
butane, 2-chloro	78-86-4			D										
butanol, 1-	71-36-3	0.1		D			8000				3.5			
butanone, 2-	78-93-3	0.6	1	D			48000		1000		21			
butene, 1,4-dichloro-2-	764-41-0			B2		0.0026				0.0004				
butylate	2008-41-5	0.05		NA			4000				1.75			
butylchloride, t-	507-20-0			D										
butylphthalyl butylglycolate (BPPG)	85-70-1	1		NA			80000				35			
butyric acid, 4-(2,4-dichlorophenoxy)	94-82-6	0.008		NA			640				0.28			
butyric acid, 4-(2-methyl-4-chlorophenoxy)	94-81-5	0.01		NA			800				0.35			
butyrolactone, gamma-	96-48-0			NA										

Sub Part 5 Action Levels - April 15, 1994															
Chemical	CAS #	Oral RfD mg/kg-d	Inh RfC mg/m3	Wt. of Evid.	Oral SF (mg/kg-d)-1	Inh. Unit Risk (ug/m3)-1	Soil Action Levels non carc. mg/kg	carc. mg/kg	Air Action Level non car ug/m3	carc. ug/m3	Water Action Level non carc. mg/L	carc. mg/L	MCL mg/L	Acute ug/L	Chronic ug/L
cadacetic acid	75-60-5	0.003		D		0.0018	240	--	--	--	0.105	--			
cadmium (carcinogenicity)	7440-43-9			B1			--	--	--	0.0006	--	--	0.005	3.9	1.1
cadmium (food)	7440-43-9	0.001		NA			80	--	--	--	0.035	--	0.005	3.9	1.1
cadmium (water)	7440-43-9	0.0005		NA			40	--	--	--	0.0175	--	0.005	3.9	1.1
calcium cyanide	592-01-8	0.04		NA			3200	--	--	--	1.4	--			
caprolactam	105-60-2	0.5		NA			40000	--	--	--	17.5	--			
captafol	2425-06-1	0.002		C	0.0086		160	813.953	--	--	0.07	0.0407			
captan	133-06-2	0.13		B2	0.0035		10400	200	--	--	4.55	0.01			
carbaryl	63-25-2	0.1		NA			8000	--	--	--	3.5	--			
carbazole	86-74-8			B2	0.02		--	35	--	--	--	0.00175			
carbofuran	1563-66-2	0.005		NA			400	--	--	--	0.175	--	0.04		
carbon disulfide	75-15-0	0.1	0.01	NA			8000	--	10	--	3.5	--			
carbon tetrachloride	56-23-5	0.0007		B2	0.13	0.000015	56	5.38462	--	0.0667	0.0245	0.00027	0.005		
carbonyl sulfide	463-58-1			NA			--	--	--	--	--	--			
carbosulfan	55285-14-8	0.01		NA			800	--	--	--	0.35	--			
carboxin	5234-68-4	0.1		NA			8000	--	--	--	3.5	--			
chloral	75-87-6	0.002		NA			160	--	--	--	0.07	--			
chloral hydrate	302-17-0			NA			--	--	--	--	--	--			
chloramben	133-90-4	0.015		NA			1200	--	--	--	0.525	--			
chloranil	118-75-2			C	0.403		--	17.3697	--	--	--	0.00087			
chlordan	57-74-9	6E-05		B2	1.3	0.00037	4.8	0.53846	--	0.0027	0.0021	2.7E-05	0.002	2.4	0.0043
chloride, ethyl	75-00-3		10	NA			--	--	10000	--	--	--			
chlorimuron-ethyl	90982-32-4	0.02		NA			1600	--	--	--	0.7	--			
chlorine	7782-50-5			NA			--	--	--	--	--	--			
chlorine cyanide	506-77-4	0.05		NA			4000	--	--	--	1.75	--			
chlorine dioxide	10049-04-4		2E-04	NA			--	--	0.2	--	--	--			
chlorite (sodium salt)	7758-19-2			NA			--	--	--	--	--	--			
chloroacetaldehyde	107-20-0			NA			--	--	--	--	--	--			
chloroacetic acid	79-11-8	0.002		NA			160	--	--	--	0.07	--			
chloroacetophenone, 2-	532-27-4		3E-05	NA			--	--	0.03	--	--	--			
chlorobenzene	108-90-7	0.02	0.02	D			1600	--	20	--	0.7	--	0.1		
chlorobenzilate	510-15-6	0.02		B2	0.27	0.000078	1600	2.59259	--	0.0128	0.7	0.00013			
chlorobenzoic acid, p-	74-11-3	0.2		NA			16000	--	--	--	7	--			
chlorobenzotrifluoride, 4-	98-56-6	0.02		NA			1600	--	--	--	0.7	--			
chlorocyclohexane, 1,2,3,4,5-pentabromo-6-	87-84-3			C	0.26		--	26.9231	--	--	--	0.00135			
chlorocyclopentadiene	41851-50-7			D			--	--	--	--	--	--			
chlorodifluoromethane	75-45-6		50	NA			--	--	50000	--	--	--			
chloroform	67-66-3	0.01		B2	0.0061	0.000023	800	114.754	--	0.0435	0.35	0.00574	0.1		
chloromethane	74-87-3			C	0.013	1.8E-06	--	538.462	--	5.5556	--	0.02692			
chloronaphthalene, beta-	91-58-7	0.08		NA			6400	--	--	--	2.8	--			
chlorophenoxyacetic acid, 2-methyl-4-	94-74-6	0.0005		NA			40	--	--	--	0.0175	--			
chloropropane, 1,2-dibromo-3-	96-12-8		2E-04	B2	1.4	6.9E-07	--	0.5	0.2	1.4493	--	2.5E-05	2E-04		
chlorophoram	101-21-3	0.2		NA			16000	--	--	--	7	--			
chlorpyrifos	2921-88-2	0.003		NA			240	--	--	--	0.105	--			
chlorpyrifos methyl	5598-13-0	0.01		NA			800	--	--	--	0.35	--			
chlorsulfuron	64902-72-3	0.05		NA			4000	--	--	--	1.75	--			
chlorthalonil	1897-45-6	0.015		B2	0.011		1200	63.6364	--	--	0.525	0.00318			
chlorthiophos	60238-56-4	0.0008		NA			64	--	--	--	0.028	--			

Sub Part S Action Levels - April 15, 1994															
Chemical	CAS #	Oral	Inh	Wt. of Evid.	Oral	Inh.	Soil Action Levels		Air Action Level		Water Action Level		MCL mg/L	AWQC - FW	
		RfD mg/kg-d	RfC mg/m3		non carc. mg/kg		carc. mg/kg	non car ug/m3	carc. ug/m3	non carc. mg/L	carc. mg/L	Acute ug/L		Chronic ug/L	
chromium (hexavalent)	18540-29-9	0.005		A		0.012	400	--	8E-05	0.175	--	0.1	16	11	
chromium (trivalent)	18085-83-1	1		B2			80000	--	--	35	--	0.1	1700	210	
chrysene	218-01-9				0.0073			95.8904	--	--	0.00479				
coke oven emissions	8007-45-2			A		0.00062	--	--	0.0016	--	--				
copper	7440-50-8	0.037		D			2960	--	--	1.295	--	1.3	18	12	
copper cyanide	544-92-3	0.005		NA			400	--	--	0.175	--				
creosote, coal tar	8001-58-9			B1			--	--	--	--	--				
creosol, 2,6-dinitro-p-	609-93-8			NA			--	--	--	--	--				
creosol, 4,6-dinitro-o-	534-52-1			NA			--	--	--	--	--				
creosol, p-chloro-m-	59-50-7			NA			--	--	--	--	--				
crotonaldehyde	123-73-9			C	1.9		--	3.68421	--	--	0.00018				
cumene	98-82-8	0.04	0.009	NA			3200	--	--	1.4	--				
cyanazine	21725-46-2	0.002		C	0.84		160	8.33333	--	0.07	0.00042				
cyanide	57-12-5	0.02		D			1600	--	--	0.7	--	0.2	22	5.2	
cyanogen	460-19-5	0.04		NA			3200	--	--	1.4	--				
cyanogen bromide	506-68-3	0.09		NA			7200	--	--	3.15	--				
cycloate	1134-23-2			NA			--	--	--	--	--				
cyclohexanol	108-93-0			NA			--	--	--	--	--				
cyclohexanone	108-94-1	5		NA			400000	--	--	175	--				
cyclohexene, 4-vinyl-1-	100-40-3	0.2		NA			--	--	--	--	--				
cyclohexylamine	108-91-8			NA			16000	--	--	7	--				
cyclopentadiene	542-92-7			NA			--	--	--	--	--				
cyhalothrin/karate	68085-85-8	0.005		NA			400	--	--	0.175	--				
cypermethrin	52315-07-8	0.01		NA			800	--	--	0.35	--				
cyromazine	66125-27-8	0.0075		NA			600	--	--	0.2625	--				
dacthal	1861-32-1	0.5		NA			40000	--	--	17.5	--				
dalapon	75-89-0	0.03		NA			2400	--	--	1.05	--	0.2			
danitol	39515-41-8			NA			--	--	--	--	--				
ddd, 4,4'-	72-54-8			B2	0.24		--	2.91667	--	--	0.00015				
dde, 4,4'-	72-55-9			B2	0.34		--	2.05882	--	--	0.0001				
ddt, 4,4'-	50-29-3	0.0005		B2	0.34	0.000097	40	2.05882	--	0.0103	0.0175	0.0001	1.1	0.001	
decabromodiphenyl ether	1163-19-5	0.01		C			800	--	--	0.35	--				
demeton	8065-48-3	4E-05		NA			3.2	--	--	0.0014	--				
di(2-ethylhexyl)adipate	103-23-1	0.6		C	0.0012		48000	5833.33	--	21	0.29167	0.4			
diallate	2303-16-4			B2	0.061		--	11.4754	--	--	0.00057				
diazinon	333-41-5	0.0009		NA			72	--	--	0.0315	--				
diazomethane	334-88-3			NA			--	--	--	--	--				
dibenz(a,h)anthracene	53-70-3			B2	7.3		--	0.09589	--	--	4.8E-08				
dibenzofuran	132-64-9			D			--	--	--	--	--				
dibenzofurans, brominated	NO CASRN			D			--	--	--	--	--				
dibromochloromethane	124-48-1	0.02		C	0.084		1600	83.3333	--	0.7	0.00417	0.1			
dibromodichloromethane	594-18-3			D			--	--	--	--	--				
dibromodiphenyl ether, p,p'-	2050-47-7			D			--	--	--	--	--				
dibromoethane, 1,2-	106-93-4	0.0002		B2	85	0.00022	16	0.00824	--	0.0045	0.007	4.1E-07	5E-05		
dicamba	1918-00-9	0.03		NA			2400	--	--	1.05	--				
dichlorobenzene, 1,2-	95-50-1	0.09	0.2	D			7200	--	200	3.15	--	0.6			
dichlorobenzene, 1,3-	541-73-1			D			--	--	--	--	--				
dichlorobenzene, 1,4-	106-46-7		0.8	C	0.024		--	291.667	800	--	0.01458	0.075			

Sub Part S Action Levels - April 15, 1994															
Chemical	CAS #	Oral	Inh	Wt. of Evid.	Oral	Inh.	Soil Action Levels non carc.	Levels carc.	Air Action Level non car	Water Action Level non carc.	MCL	AWQC - FW			
		RfD mg/kg-d	RfC mg/m3		SF (mg/kg-d)-1	Unit Risk (ug/m3)-1							mg/kg	carc. mg/kg	ug/m3
dichlorobenzidine, 3,3-	91-94-1			B2		0.45	18000	--	200	7					
dichlorodifluoromethane	75-71-8	0.2	0.2	NA			8000	--	500	3.5					
dichloroethane, 1,1-	75-34-3	0.1	0.5	C											
dichloroethane, 1,2-	107-06-2			B2	0.091	0.000026		7.69231			0.005				
dichloroethene, 1,1-	75-35-4	0.009		C	0.6	0.00005	720	11.6667		0.315	0.007				
dichloroethene, 1,2- (mixed isomers)	540-59-0	0.009		NA			720	--		0.315					
dichloroethene, cis-1,2-	156-59-2	0.01		D			800	--		0.35	0.07				
dichloroethene, trans-1,2-	156-60-5	0.02		NA			1600	--		0.7	0.1				
dichlorophenol, 2,3-	576-24-9			NA			--	--		--					
dichlorophenol, 2,4-	120-83-2	0.003		NA			240	--		0.105					
dichlorophenol, 2,5-	583-78-8			NA			--	--		--					
dichlorophenol, 2,6-	87-65-0			NA			--	--		--					
dichlorophenol, 3,4-	95-77-2			NA			--	--		--					
dichlorophenol, 3,5-	591-35-5			NA			--	--		--					
dichlorophenoxyacetic acid, 2,4-	94-75-7	0.01		NA			800	--		0.35	0.07				
dichloropropane, 1,1-	78-99-9			NA			--	--		--					
dichloropropane, 1,2-	78-87-5		0.004	B2	0.068		--	10.2941	4	--	0.00051	0.005			
dichloropropane, 1,3-	142-28-9			NA			--	--		--					
dichloropropane, 2,2--	594-20-7			NA			--	--		--					
dichloropropanol, 2,3-	616-23-9	0.003		NA			240	--		0.105					
dichloropropene, 1,3-	542-75-6	0.0003	0.02	B2	0.18	0.000037	24	3.88889	20	0.027	0.0105				
dichlorprop	120-36-5			NA			--	--		--					
dichlorvos	62-73-7	0.0005		B2	0.29		40	2.41379		0.0175	0.00012				
dicolol	115-32-2			NA			--	--		--					
dicyclopentadiene	77-73-6	0.03	2E-04	NA			2400	--	0.2	1.05					
dieldrin	60-57-1	5E-05		B2	16	0.0046	4	0.04375		0.0002	0.00175	2.5			
diesel engine emissions	NO CASRN		0.005	NA			--	--	5	--		0.0019			
diethyl sulfate	64-67-5			NA			--	--		--					
diethylene glycol dinitrate	693-21-0			D			--	--		--					
diethylformamide	617-84-5	0.011		NA			880	--		0.385					
diethylphthalate	84-66-2	0.8		D			64000	--		28					
diethylstilbestrol	56-53-1			A	4700		--	0.00015		--	7.4E-09				
difenzoquat	43222-48-6	0.08		NA			6400	--		2.8					
diffenazuron	35367-38-5	0.02		NA			1600	--		0.7					
diisopropyl methylphosphonate	1445-75-6	0.08		D			6400	--		2.8					
dimethipin	55290-64-7	0.02		C			1600	--		0.7					
dimethoate	60-51-5	0.0002		NA			16	--		0.007					
dimethylamine	124-40-3			NA			--	--		--					
dinoseb	88-85-7	0.001		D			80	--		0.035	0.007				
dioxane, 1,4-	123-91-1			B2	0.011		--	63.6364		--	0.00318				
dioxin (2,3,7,8-TCDD)	1746-01-6			B2	150000	0	--	4.7E-06		--	2.3E-10	3E-08			
diphenamid	957-51-7	0.03		NA			2400	--		1.05					
diquat	85-00-7			NA			--	--		--	0.02				
direct black 38	1937-37-7			A	8.6		--	0.0814		--	4.1E-06				
direct blue 6	2602-46-2			A	8.1		--	0.08642		--	4.3E-06				
direct brown 95	16071-86-6			A	9.3		--	0.07527		--	3.8E-06				
direct lightfast blue	4399-55-7			NA			--	--		--					
direct sky blue 6B	2610-05-1			B2			--	--		--					

Sub Part 5 Action Levels - April 15, 1994																			
Chemical	CAS #	RID	mg/kg-d	4E-05	mg/m3	Inh	Wt. of Evid.	Oral SF	Unit Risk (ug/m3)-1	Inh.	Soil Action Levels		Air Action Level		Water Action Level		MCL	AWQC - FW	
											non car. mg/kg	carc. mg/kg	non car. ug/m3	carc. ug/m3	non car. mg/L	carc. mg/L		Acute ug/L	Chronic ug/L
Chemical disulfoton	298-04-4						NA					3.2			0.0014				
dithiane, 1,4-	505-29-3		0.01				D				800				0.35				
dithioproprylcarbamate, s-ethyl-	759-94-4		0.025				NA				2000				0.875				
diuron	330-54-1		0.002				NA				160				0.07				
dodecanoate, 2-ethoxyethanol	106-13-8						NA												
dodone	2439-10-3		0.004				NA				320				0.14				
endosulfan	115-29-7		5E-05				NA				4				0.00175				
endothall	145-73-3		0.02				NA				1600				0.7				
endrin	72-20-8		0.0003				D				24				0.0105				
environmental tobacco smoke	NO CAS RN						NA												
epichlorohydrin	106-89-8		0.002		0.001	0.0099	B2	0.0099	1.2E-06		160	70.7071	1	0.8333	0.07	0.00354	0.01		
epoxybutane, 1,2-	106-88-7				0.02		NA						20						
ethane, 1,1,1-trichloro	71-55-6						D												
ethane, 1,1,2-trichloro	79-00-5		0.004				C		0.057	0.000016	320	122.807		0.625	0.14	0.00614	0.005		
ethane, 1,1,2-trichloro-1,2,2-trifluoro	78-13-1		30		30		NA				2400000		30000		1050				
ethanol acetate, 2-ethoxy	111-15-9		0.3				NA				24000				10.5				
ethanol, 2-ethoxy	110-90-5		0.4		0.2		NA				32000		200		14				
ethephon	16672-87-0		0.005				NA				400				0.175				
ether, 2,4,4'-trichloro-2'-hydroxydiphenyl	3380-34-5						NA												
ether, 2-chloroethylvinyl	110-75-8						NA												
ether, 4-bromophenylphenyl	101-55-3						D												
ether, bis(2-chloroethyl)	111-44-4						B2		1.1	0.00033		0.63638		0.003		3.2E-05			
ether, bis(2-chloroisopropyl)	39638-32-9		0.04				C		0.07	0.00001	3200	100		1	1.4	0.005			
ether, bis(chloromethyl)	542-88-1						A		220	0.062		0.00318		2E-06		1.8E-07			
ether, chloromethylmethyl	107-30-2						A												
ether, diethylene glycol monobutyl	112-34-5				0.02		NA						20						
ether, diethylene glycol monoethyl	111-90-0		2				NA				160000				70				
ether, ethyl	60-29-7		0.2				NA				16000				7				
ether, ethylene glycol monobutyl	111-76-2				0.02		NA						20						
ether, nonabromodiphenyl	63936-56-1						D												
ether, propylene glycol monoethyl	52125-53-8		0.7				NA				56000				24.5				
ether, propylene glycol monomethyl	107-98-2		0.7		2		NA				56000		2000		24.5				
ethion	563-12-2						NA												
ethoprop	13194-48-4						NA												
ethoxyethanol phosphated, 2-	68554-00-7						NA												
ethyl carbamate	51-79-6						NA												
ethyl p-nitrophenyl phenylphosphorothioate	2104-84-5		1E-05				NA				0.8				0.00035				
ethylbenzene	100-41-4		0.1		1		D				8000		1000		3.5		0.7		
ethylene cyanohydrin	109-74-8		0.3				NA				24000				10.5				
ethylene diamine	107-15-3		0.02				D				1600				0.7				
ethylene glycol	107-21-1		2				NA				160000				70				
ethylene oxide	75-21-8						B1		1.02	0.0001		0.88627		0.01		3.4E-05			
ethylene thiourea	96-45-7		8E-05				B2		0.6		6.4	1.16667			0.0028	5.8E-05			
ethyleneimine	151-56-4						NA												
ethylnitrosourea	759-73-9						B2		140			0.005				2.5E-07			
ethylphthalyl ethylglycolate (EPEG)	84-72-0				3		NA				240000				105				
express	101200-48-		0.008				NA				640				0.28				
fenamiphos	22224-92-6		0.0003				NA				20				0.00875				

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Chemical	CAS #	Oral RfD mg/kg-d	Inh RfC mg/m3	Wt. of Evid.	Oral SF (mg/kg-d)-1	Inh. Unit Risk (ug/m3)-1	Soil Action Levels non carc. mg/kg	carc. mg/kg	Air Action Level non car ug/m3	carc. ug/m3	Water Action Level non carc. mg/L	carc. mg/L	MCL mg/L	AWQC - Acute ug/L	FW Chronic ug/L
fluometuron	2164-17-2	0.013		NA			1040				0.455				
fluoranthene	206-44-0	0.04		D			3200				1.4				
fluorene	86-73-7	0.04		D			3200				1.4				
fluorine (soluble fluoride)	7782-41-4	0.06		NA			4800				2.1		4		
fluridone	59756-60-4	0.08		NA			6400				2.8				
flurprimidol	56425-91-3	0.02		NA			1600				0.7				
flutolanil	66332-96-5	0.06		NA			4800				2.1				
fluvinate	69409-94-5	0.01		NA			800				0.35				
folpet	133-07-3	0.1		B2	0.0035		8000	200			3.5	0.01			
fomesafen	72178-02-0			C	0.19			36.8421				0.00184			
fonofos	944-22-9			NA											
formaldehyde	50-00-0	0.2		B1		0.000013	16000			0.0769	7				
formaldehyde cyanohydrin	107-16-4			NA											
formamide, n,n-dimethyl	68-12-2	0.1	0.03	NA			8000		30		3.5				
formic acid	64-18-6	2		NA			160000				70				
fosetyl-al	39148-24-8			NA											
furan	110-00-8	0.001		NA			80				0.035				
furalidone	67-45-8			B2	3.8			0.18421				9.2E-08			
furfural	98-01-1	0.003	0.05	NA			240		50		0.105				
furfurim	531-82-8			B2	50			0.014				7E-07			
furmecyclo	60568-05-0			B2	0.03			23.3333				0.00117			
glufosinate-ammonium	77182-82-2	0.0004		NA			32				0.014				
glycidaldehyde	765-34-4	0.0004	0.001	B2			32		1		0.014				
glyphosate	1071-83-6			NA									0.7		
halosulfuron methyl	100784-20-1			NA											
haloxyfop-methyl	69806-40-2	5E-05		NA			4				0.00175				
harmony	79277-27-3	0.013		NA			1040				0.455				
heptachlor	76-44-8	0.0005		B2	4.5	0.0013	40	0.15556		0.0008	0.0175	7.8E-08	4E-04	0.52	0.0038
heptachlor epoxide	1024-57-3	1E-05		B2	9.1	0.0026	1.04	0.07692		0.0004	0.00046	3.8E-06	2E-04	0.52	0.0038
heptafluoropropane, 1,1,1,2,3,3,3-	431-89-0			NA											
heptane, n-	142-82-5			D											
hexabromobenzene	87-82-1	0.002		NA			160				0.07				
hexabromodiphenyl ether	36483-60-0			D											
hexachlorobenzene	118-74-1	0.0008		B2	1.6	0.00046	64	0.4375		0.0022	0.028	2.2E-05	0.001		
hexachlorobutadiene	87-68-3	0.0002		C	0.078	0.00022	16	89.7436		0.4545	0.007	0.00449			
hexachlorocyclohexane, alpha-	319-84-6			B2	6.3	0.0018		0.11111		0.0006		5.6E-06			
hexachlorocyclohexane, beta-	319-85-7			C	1.8	0.00053		3.88889		0.0189		0.00019			
hexachlorocyclohexane, delta-	319-86-8			D											
hexachlorocyclohexane, epsilon-	6108-10-7			D											
hexachlorocyclohexane, gamma-	58-89-9	0.0003		B2 - C	1.3		24	0.53846			0.0105	2.7E-05	2E-04	2	0.08
hexachlorocyclohexane, technical	608-73-1			B2	1	0.00051		0.7		0.002		3.5E-05			
hexachlorocyclopentadiene	77-47-4	0.007	7E-05	D			560		0.07		0.245		0.05		
hexachlorodibenzo-p-dioxin	19408-74-3			B2	6200	1.3		0.00011		8E-07		5.6E-09			
hexachloroethane	67-72-1	0.001		C	0.014	0.000004	80	500		2.5	0.035	0.025			
hexachlorophene	70-30-4	0.0003		NA			24				0.0105				
hexamethylene diamine	124-09-4			NA											
hexane, n-	110-54-3	0.06	0.2	NA			4800		200		2.1				
hexanone, 2-	591-78-6			NA											

Sub Part S Action Levels - April 15, 1994										Air Action Level				Water Action Level				MCL		AWQC - FW			
Chemical	CAS #	Oral RfD mg/kg-d	Inh RfC mg/m3	Wt. of Evid.	Oral SF (mg/kg-d)-1	Inh. Unit Risk (ug/m3)-1	Soil Action Levels non car. mg/kg	carc. mg/kg	non car. ug/m3	carc. ug/m3	non car. mg/L	carc. mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
hexazinone	51235-04-2	0.033		NA																			
hmz	2891-41-0	0.05		D				2640						1.155									
hydrazine	302-01-2			B2		3 0.0049		4000						1.75									
hydrazine sulfate	10034-93-2			B2		3 0.0049				0.0002													
hydrazine, 1,1-dimethyl	507-14-7			B2		2.6 0.001				0.0002													
hydrazine, 1,2-diethyl	1615-80-1			NA						0.001													
hydrazine, 1,2-dimethyl	540-73-8			B2																			
hydrazine, 1,2-diphenyl	122-68-7			B2																			
hydrogen chloride	7647-01-0		0.007	NA		0.8 0.00022				0.0045													
hydrogen cyanide	74-90-8			NA																			
hydrogen sulfide	7738-06-4	0.003	9E-04	NA				240						0.105									
hydroquinone	123-31-9	0.04		NA				3200						1.4									
imazali	35554-44-0			NA																			
imazaquin	81335-37-7			NA																			
indeno(1,2,3-cd)pyrene	193-39-5			B2		0.73		0.9589															
iprodione	36734-19-7	0.04		NA				3200						1.4									
iron	7439-89-6			NA																			
isobutyl alcohol	78-83-1	0.3		NA				24000						10.5									
isophorone	78-59-1	0.2		C		0.00095		16000						7									
isopropalin	33820-53-0	0.015		NA				1200						0.525									
isopropyl methyl phosphonic acid	1832-54-8	0.1		D				8000						3.5									
isoxaben	82558-50-7	0.05		C				4000						1.75									
isofen	77501-63-4	0.002		NA				160						0.07									
lactonitrile	78-97-7			NA																			
lead	7439-92-1			B2																			
limonene, d-	5989-27-5			NA																			
linuron	330-55-2	0.002		C				160						0.07									
lindax	83055-99-6			NA																			
malanitrile	109-77-3	2E-05		NA				1.6						0.0007									
malathion	121-75-5	0.02		NA				1600						0.7									
maleic anhydride	108-31-6	0.1		NA				8000						3.5									
maleic hydrazide	123-33-1	0.5		NA				40000						17.5									
mancozeb	8018-01-7	0.03		NA				2400						1.05									
maneb	12427-38-2	0.005		NA				400						0.175									
manganese (food)	7439-98-5	0.14	4E-04	D				11200						4.9									
manganese (water)	7439-98-5	0.005	4E-04	D				400						0.175									
mepesofol	950-10-7	9E-05		NA				7.2						0.00315									
mepiquat chloride	24307-26-4	0.03		NA				2400						1.05									
mercuric chloride	7487-94-7			NA																			
mercury	7439-97-6	0.0003	3E-04	D				24		0.3				0.0105									
merphos	150-50-5	3E-05		NA				2.4						0.00105									
merphos oxide	78-48-8	3E-05		NA				2.4						0.00105									
metaxyl	57837-19-1			NA																			
methacrylate, 2-ethoxyethyl	2370-63-0			NA																			
methacrylate, ethyl	97-63-2	0.09		NA				7200						3.15									
methacrylonitrile	126-98-7	0.0001	7E-04	NA				8		0.7				0.0035									
methamidphos	10265-92-6	5E-05		NA				4						0.00175									
methanol	67-56-1	0.5		NA				40000						17.5									

Sub Part S Action Levels - April 15, 1994															
	CAS #	Oral RfD	Inh RfC	Wt. of Evid.	Oral SF	Inh. Unit Risk (ug/m3)-1	Soil Action Levels non car. mg/kg	carc. mg/kg	Air Action Level non car ug/m3	carc. ug/m3	Water Action Level non car. mg/L	carc. mg/L	MCL mg/L	AWQC - FW Acute ug/L	Chronic ug/L
Chemical	950-37-8	0.001		C			80				0.035				
methidathion	18752-77-5	0.025		NA			2000				0.875				
methomyl	72-43-5	0.005		D			400				0.175		0.04		
methoxyethanol acetate, 2-	110-49-6	0.002		NA			160				0.07				
methoxyethanol, 2-	109-86-4	0.001	0.02	NA			80		20		0.035				
methyl acetate	79-20-9	1		NA			80000				35				
methyl acrylate	96-33-3	0.03		D			2400				1.05				
methyl chlorocarbonate	79-22-1			NA											
methyl ethyl ketone peroxide	1338-23-4			NA											
methyl hydrazine	60-34-4			B2	1.1			0.63636					3.2E-05		
methyl iodide	77-88-4			NA											
methyl isocyanate	624-83-9			NA											
methyl mercury	22967-92-6	0.0003		NA			24				0.105				
methyl methacrylate	80-62-6	0.08		NA			6400				2.8				
methyl parathion	298-00-0	0.0003		NA			20				0.00875				
methyl styrene	25013-15-4	0.006	0.04	NA			480		40		0.21				
methyl styrene, alpha-	98-83-9	0.07		NA			5600				2.45				
methyl tert-butyl ether	1634-04-4		3	NA					3000						
methylaniline hydrochloride, 2-	636-21-5			B2	0.18			3.88889					0.00019		
methylaniline, 2-	95-53-4			B2	0.24			2.91667					0.00015		
methylchloranthracene, 3-	56-49-5			NA											
methylcyclohexane	108-87-2			3	NA				3000						
methylene chloride	75-09-2	0.06		3	B2	0.0075	4800	93.3333	3000	2.1277	2.1	0.00467	0.005		
methylene-bis(2-chloroaniline), 4,4'-	101-14-4	0.0007		B2	0.13	0.000037	56	5.38462		0.027	0.0245	0.00027			
methylene-bis(N,N-dimethylaniline), 4,4'-	101-61-1			B2	0.046			15.2174				0.00076			
methylenebisbenzidine, 4,4'-	101-77-9			B2	0.25			2.8				0.00014			
methylenediphenyl isocyanate, 4,4'-	101-68-8		2E-05	NA					0.02						
methylnitrosourea	684-93-5			B2											
methylphenol, 2-	95-48-7	0.05		C			4000				1.75				
methylphenol, 3-	108-39-4	0.05		C			4000				1.75				
methylphenol, 4-	106-44-5	0.005		C			400				0.175				
metolachlor	51218-45-2	0.15		NA			12000				5.25				
metribuzin	21087-64-9	0.025		D			2000				0.875				
mirex	2385-85-5	0.0002		B2	1.8		16	0.38889			0.007	1.9E-05			
molinate	2212-67-1	0.002		NA			160				0.07				
molybdenum	7439-98-7	0.005		NA			400				0.175				
monochloramine	10599-90-3	0.1		D			8000				3.5				
naled	300-76-5			NA											
naphthalene	91-20-3			D											
naphthol hydrochloride, 1-amino-2-	1198-27-2			NA											
naphthol, 1-amino-2-	2834-92-6			NA											
naphthoquinone, 1,4-	130-15-4			NA											
napropamide	15299-99-7	0.1		NA			8000				3.5				
niagra blue 4B	2429-74-5			B2											
nickel	7440-02-0	0.02		NA			1600				0.7		0.1	1400	160
nickel carbonyl	13463-39-3			B2											
nickel refinery dust	NO CASRN			A		0.00024				0.0042					
nickel subsulfide	12035-72-2			A		0.00048				0.0021					



Sub Part S Action Levels - April 15, 1994															Air Action Level				Water Action Level		MCL		AWQC - FW	
Chemical	CAS #	Oral	Inh	Wt. of Evid.	Oral	Inh.	Soil Action Levels		Air Action Level		Water Action Level		MCL	AWQC - FW										
		RfD mg/kg-d	RfC mg/m3		SF (mg/kg-d)-1	Unit Risk (ug/m3)-1	non carc. mg/kg	carc. mg/kg	non car ug/m3	carc. ug/m3	non carc. mg/L	carc. mg/L			Acute ug/L	Chronic ug/L								
nicotinonitrile	100-54-9			NA																				
nitrapyrin	1929-82-4			NA																				
nitrate	14797-55-8	1.6		NA			128000				58		10											
nitric oxide	10102-43-9	0.1		NA			8000				3.5													
nitrite	14797-85-0	0.1		NA			8000				3.5		1											
nitroaniline, 2-methoxy-5-	99-59-2			B2	0.046			15.2174				0.00078												
nitroaniline, 2-methyl-5-	99-55-8			C	0.033			212.121				0.01061												
nitroaniline, m-	99-09-2		2E-04	NA					0.2															
nitroaniline, o-	88-74-4		2E-04	NA					0.2															
nitroaniline, p-	100-01-6			NA																				
nitrobenzene	98-95-3	0.0005	0.002	D			40		2		0.0175													
nitrofurantoin	67-20-9	0.07		NA			5600				2.45													
nitrofuranone	59-87-0			B2	1.5			0.46667				2.3E-05												
nitrogen dioxide	10102-44-0	1		NA			80000				35													
nitroguanidine	558-88-7	0.1		D			8000				3.5													
nitromethane	75-52-5			NA																				
nitrosodiethanolamine, N-	1116-54-7			B2	2.8			0.25				1.3E-05												
nitrosodiethylamine, N-	55-18-5			B2	150	0.043		0.00467		2E-05		2.3E-07												
nitrosodimethylamine, N-	62-75-9			B2	51	0.014		0.01373		7E-05		6.9E-07												
nitrosodiphenylamine, p-	156-10-5			NA																				
nitrosomethylamine, N-	10595-95-6			B2	22			0.03182				1.6E-08												
nitrosomethylvinylamine, N-	4549-40-0			B2																				
nitrosopyrrolidine, N-	930-55-2			B2	2.1	0.00061		0.33333		0.0016		1.7E-05												
nitrotoluene, m-	99-08-1	0.01		NA			800				0.35													
nitrotoluene, o-	88-72-2	0.01		NA			800				0.35													
nitrotoluene, p-	98-99-0	0.01		NA			800				0.35													
norflurazon	27314-13-2			NA																				
nustar	85509-19-9	0.0007		NA			58				0.0245													
octabromodiphenyl ether	32536-52-0	0.003		D			240				0.105													
octamethylpyrophosphoramide	152-16-9	0.002		NA			160				0.07													
oryzalin	19044-88-3			NA																				
oxadiazon	19666-30-9	0.005		NA			400				0.175													
oxamyl	23135-22-0			NA								0.2												
oxyfluorfen	42874-03-3			NA																				
ozone	10028-15-6			NA																				
paclobutrazol	76738-82-0			NA																				
paraaldehyde	123-63-7			NA																				
paraquat	1910-42-5			NA																				
parathion	56-38-2	0.006		C			480				0.21													
pebulate	1114-71-2	0.05		NA			4000				1.75													
pendimethalin	40487-42-1	0.04		NA			3200				1.4													
pentabromodiphenyl ether	32534-81-9	0.002		D			160				0.07													
pentachlorobenzene	608-93-5	0.0008		D			64				0.028													
pentachlorocyclopentadiene	25329-35-5			D																				
pentachlorophenol	87-86-5	0.03		B2	0.12		2400	5.83333			1.05	0.00029	0.001	20										
pentachloropropene, 1,1,2,3,3-	1600-37-9			NA										13										
pentane, n-	109-66-0			NA																				
pentanone, 4-methyl-2-	108-10-1	0.05	0.08	NA			4000		80		1.75													

Sub Part S Action Levels - April 15, 1994															
Chemical	CAS #	Oral RfD mg/kg-d	Inh RfC mg/m3	Wt. of Evid.	Oral SF (mg/kg-d)-1	Inh. Unit Risk (ug/m3)-1	Soil Action Levels non carc. mg/kg	Soil Action Levels carc. mg/kg	Air Action Level non car ug/m3	Air Action Level carc. ug/m3	Water Action Level non carc. mg/L	Water Action Level carc. mg/L	MCL mg/L	AWQC - FW Acute ug/L	AWQC - FW Chronic ug/L
perfluorobutane	355-25-9			NA											
perfluoroethane	354-33-8			NA											
perfluorohexane	355-42-0			NA											
permethrin	52645-53-1			NA											
phenanthrene	85-01-8			D											
phenmedipham	13684-63-4	0.2	0.2	NA			16000				7				
phenol	108-95-2	0.6	0.6	D			48000				21				
phenol, 2,3,4-trichloro	15950-66-0			NA											
phenol, 2,3,5-trichloro	933-78-8			NA											
phenol, 2,3,6-trichloro	933-75-5			NA											
phenol, 2,3-dimethyl	526-75-0			NA											
phenol, 2,3-dinitro	66-56-8			NA											
phenol, 2,4,5-trichloro	95-95-4	0.1	0.1	NA			8000				3.5				
phenol, 2,4,6-trichloro	88-06-2			B2	0.011	3.1E-06		83.6364		0.3226		0.00318			
phenol, 2,4-dimethyl	105-67-9	0.02	0.02	NA			1600				0.7				
phenol, 2,4-dinitro	51-28-5	0.002	0.002	NA			160				0.07				
phenol, 2,5-dimethyl	95-87-4			NA											
phenol, 2,5-dinitro	329-71-5			NA											
phenol, 2,6-dimethyl	576-26-1	0.0006	0.0006	NA			48				0.021				
phenol, 2,6-dinitro	573-56-8			NA											
phenol, 2-chloro	95-57-8	0.005	0.005	NA			400				0.175				
phenol, 3,4,5-trichloro	609-19-8			NA											
phenol, 3,4-dimethyl	95-65-8	0.001	0.001	NA			80				0.035				
phenol, 3,5-dinitro	586-11-8			NA											
phenol, 3-chloro	108-43-0			NA											
phenol, 4,6-dinitro-o-cyclohexyl	131-89-5	0.002	0.002	NA			160				0.07				
phenol, 4-chloro	106-48-9			NA											
phenol, m-amino	591-27-5	0.07	0.07	NA			5600				2.45				
phenol, o-amino	95-55-6			NA											
phenol, p-amino	123-30-8			NA											
phenol, p-nitro	100-02-7			NA											
phenylenediamine, m-	108-45-2	0.006	0.006	NA			480				0.21				
phenylenediamine, o-	95-54-5			B2	0.047			14.8936				0.00074			
phenylenediamine, p-	106-50-3	0.19	0.19	NA			15200				6.65				
phenylmercuric acetate	62-38-4	8E-05	8E-05	NA			6.4				0.0028				
phenylphenol, 2-	90-43-7			C	0.00194			3608.25				0.18041			
phorate	298-02-2	0.0002	0.0002	NA			16				0.007				
phosalone	2310-17-0			NA											
phosgene	75-44-5			NA											
phosmet	732-11-6			NA											
phosphate, diethyl-p-nitrophenyl	311-45-5			D											
phosphine	7803-51-2	0.0003	3E-05	NA			24		0.03		0.0105				
phosphorus	7723-14-0	2E-05	2E-05	D			1.6				0.0007				
phthalate, bis(2-ethylhexyl)	117-81-7	0.02	0.02	B2	0.014		1600	50			0.7	0.0025	0.006		
phthalate, di-n-butyl	84-74-2	0.1	0.1	D			8000				3.5				
phthalate, di-n-octyl-	117-84-0	0.02	0.02	NA			1600				0.7				
phthalate, dimethyl	131-11-3	10	10	D			800000				350				
phthalate, dimethyltere	120-61-6	0.1	0.1	NA			8000				3.5				

Sub Part S Action Levels - April 15, 1994																
Chemical	CAS #	Oral		Inh	Wt. of Evid.	SF	Inh.	Soil Action Levels		Air Action Level		Water Action Level		MCL	AWQC - FW	
		RfD mg/kg-d	RfC mg/m3					non carc. mg/kg	carc. mg/kg	non car ug/m3	carc. ug/m3	non carc. mg/L	carc. mg/L		Acute ug/L	Chronic ug/L
phthalate, N-butylbenzyl	85-68-7	0.2			C			16000	--	--	--	7	--			
phthalic acid, m-	121-91-5				NA			--	--	--	--	--	--			
phthalic acid, o-	88-99-3				NA			--	--	--	--	--	--			
phthalic acid, p-	100-21-0	1			NA			80000	--	--	--	35	--			
phthalic anhydride	85-44-9	2	0.12	NA				180000	--	120	--	70	--			
picloram	1918-02-1	0.07			NA			5600	--	--	--	2.45	--	0.5		
pinene, alpha-	80-56-8				NA			--	--	--	--	--	--			
pinene, beta-	127-91-3				NA			--	--	--	--	--	--			
pinimphos-methyl	29232-93-7	0.01			NA			800	--	--	--	0.35	--			
polybrominated biphenyls	NO CASRN	7E-08			NA			0.56	--	--	--	0.00025	--			
polychlorinated biphenyls (PCBs)	1336-36-3				B2	7.7		--	0.09091	--	--	--	4.5E-06	5E-04		0.014
polycyclic organic matter (POM)	NO CASRN				NA			--	--	--	--	--	--			
potassium bromate	7758-01-2				NA			--	--	--	--	--	--			
potassium cyanide	151-50-8	0.05			NA			4000	--	--	--	1.75	--			
potassium silver cyanide	508-61-6	0.2			NA			16000	--	--	--	7	--			
prochloraz	67747-09-5	0.009			C	0.15		720	46.6667	--	--	0.315	0.00233			
profluralin	26399-36-0	0.006			NA			480	--	--	--	0.21	--			
prometon	1810-18-0				NA			--	--	--	--	--	--			
prometryn	7287-19-6	0.004			NA			320	--	--	--	0.14	--			
pronamide	23950-58-5	0.076			NA			6000	--	--	--	2.625	--			
propachlor	1918-16-7	0.013			NA			1040	--	--	--	0.455	--			
propane, 2-chloro	75-29-6	0.1			NA			8000	--	--	--	3.5	--			
propane, 2-nitro	79-46-9		0.02	B2		0.0027		--	--	20	0.0004	--	--			
propanil	709-98-8				NA			--	--	--	--	--	--			
propargite	2312-35-8	0.02			NA			1600	--	--	--	0.7	--			
propargyl alcohol	107-19-7	0.002			NA			160	--	--	--	0.07	--			
propazine	139-40-2	0.02			NA			1600	--	--	--	0.7	--			
propham	122-42-9	0.02			NA			1600	--	--	--	0.7	--			
propiconazole	60207-90-1	0.013			NA			1040	--	--	--	0.455	--			
propionolactone, beta-	57-57-8				NA			--	--	--	--	--	--			
propionic acid, 2(2,4,5-trichlorophenoxy)	93-72-1	0.008			D			640	--	--	--	0.28	--	0.05		
propionic acid, 2-(2-methyl-4-chlorophenoxy)	93-65-2	0.001			NA			80	--	--	--	0.035	--			
propionitrile	107-12-0				NA			--	--	--	--	--	--			
propyl alcohol, n-	71-23-8				NA			--	--	--	--	--	--			
propylene glycol	57-55-6	20			NA			1600000	--	--	--	700	--			
propylene oxide	75-56-9		0.03	B2		0.24	3.7E-08	--	2.91667	30	0.2703	--	0.00015			
propyleneimine	75-55-8				NA			--	--	--	--	--	--			
prossult	81335-77-5	0.25			NA			20000	--	--	--	8.75	--			
pydrin	51630-58-1				NA			--	--	--	--	--	--			
pyrene	129-00-0	0.03			D			2400	--	--	--	1.05	--			
pyridine	110-86-1	0.001			NA			80	--	--	--	0.035	--			
pyridine, 4-amino	504-24-5	2E-05			D			1.6	--	--	--	0.0007	--			
quinalphos	13593-03-8				NA			--	--	--	--	--	--			
quinoline	91-22-5				C	12		--	0.58333	--	--	--	2.9E-05			
quinone	106-51-4				NA			--	--	--	--	--	--			
radium 226,228	7440-14-4				NA			--	--	--	--	--	--			
radon 222	14859-67-7				NA			--	--	--	--	--	--			
rdx	121-82-4	0.003			C	0.11		240	63.6364	--	--	0.105	0.00318			

Sub Part S Action Levels - April 15, 1994												
Chemical	CAS #	Oral	Inh	Wt. of Evid.	Oral	Inh.	Soil Action Levels non carc. mg/kg	Air Action Level non car ug/m3	Water Action Level		MCL mg/L	AWQC - FW Acute ug/L
		RfD mg/kg-d	RfC mg/m3		Oral SF (mg/kg-d)-1	Unit Risk (ug/m3)-1			non carc. mg/L	carc. mg/L		
refractory ceramic fibers	NO CASRN											
resmethrin	10453-88-8	0.03		NA			2400	--	1.05			
ronnel	299-84-3	0.05		NA			4000	--	1.75			
rotenone	83-79-4	0.004		NA			320	--	0.14			
savay	78587-05-0	0.025		NA			2000	--	0.875			
selenious acid	7783-00-8	0.005		D			400	--	0.175			
selenium	7782-49-2	0.005		D			400	--	0.175		0.05	20
selenium sulfide	7446-34-6			B2			--	--	--			5
selenourea	630-10-4	0.005		NA			400	--	0.175			
sethoxydim	74051-80-2	0.09		NA			7200	--	3.15			
silver	7440-22-4	0.005		D			400	--	0.175			4.1
silver cyanide	506-64-9	0.1		NA			8000	--	3.5			
simazine	122-34-9	0.005		C	0.12		400	58.3333	0.175	0.00292	0.004	
sodium azide	26828-22-8	0.004		NA			320	--	0.14			
sodium cyanide	143-33-9	0.04		NA			3200	--	1.4			
sodium diethyldithiocarbamate	148-18-5	0.03		C	0.27		2400	25.9259	1.05	0.0013		
sodium fluoroacetate	62-74-8			NA			--	--	--			
sodium metavanadate	13718-26-8	0.001		NA			80	--	0.035			
strontium	7440-24-6	0.8		NA			48000	--	21			
strychnine	57-24-9	0.0003		NA			24	--	0.0105			
styrene	100-42-5	0.2	1	NA			16000	--	7	0.1		
succinonitrile	110-81-2			NA			--	--	--			
sulfate, dimethyl	77-78-1			B2			--	--	--			
sulfide, p-chlorophenyl methyl	123-09-1			D			--	--	--			
sulfone, p-chlorophenyl methyl	98-57-7			D			--	--	--			
sulfoxide, p-chlorophenyl methyl	934-73-6			D			--	--	--			
sulfuric acid	7664-93-9		0.07	NA			--	70	--			
sythane	88761-89-0	0.025		NA			2000	--	0.875			
tebuthiuron	34014-18-1	0.07		NA			5600	--	2.45			
temephos	3383-96-8	0.02		NA			1600	--	0.7			
terbacil	5902-51-2			NA			--	--	--			
terbufos	13071-79-9	3E-05		NA			2	--	0.00088			
terbutryn	888-50-0	0.001		NA			80	--	0.035			
tetrabromodiphenyl ether	40088-47-9			D			--	--	--			
tetrachloroazobenzene	21232-47-3			NA			--	--	--			
tetrachlorobenzene, 1,2,4,5-	95-94-3	0.0003		NA			24	--	0.0105			
tetrachlorocyclopentadiene	695-77-2			D			--	--	--			
tetrachloroethane, 1,1,1,2-	630-20-6	0.03		C	0.026	7.4E-06	2400	269.231	1.3514	1.05	0.01346	
tetrachloroethane, 1,1,2,2-	79-34-5			C	0.2	0.000058	--	35	0.1724	--	0.00175	
tetrachloroethene	127-18-4	0.01		C-B2	0.052	5.8E-07	800	134.615	17.241	0.35	0.00673	0.005
tetrachlorohydrobenzene	71753-42-9			NA			--	--	--			
tetrachlorophenol, 2,3,4,5-	4901-51-3			NA			--	--	--			
tetrachlorophenol, 2,3,4,6-	58-90-2	0.03		NA			2400	--	1.05			
tetrachlorophenol, 2,3,5,6-	935-95-5			NA			--	--	--			
tetrachloropropene, 1,1,2,3-	10436-39-2			NA			--	--	--			
tetrachlorotoluene, P-, a,a-	5216-25-1			B2	20		--	0.035	--	--	1.8E-06	
tetrachlorvinphos	961-11-5	0.03		C	0.024		2400	291.667	1.05	0.01458		
tetraethyl dithiopyrophosphate	3689-24-5	0.0005		NA			40	--	0.0175			

Sub Part S Action Levels - April 15, 1994															
Chemical	CAS #	Oral	Inh	Wt. of Evid.	Oral	Unit Risk (ug/m3)-1	Inh.	Soil Action Levels		Air Action Level		Water Action Level		MCL mg/L	AWQC - FW
		RfD mg/kg-d	RfC mg/m3		non carc. mg/kg			carc. mg/kg	non car ug/m3	carc. ug/m3	non carc. mg/L	carc. mg/L			
tetraethyl lead	78-00-2			NA											
thallic oxide	1314-32-5	7E-05		D					5.8			0.00245		0.002	
thallium	7440-28-0			NA										0.002	
thallium (I) acetate	583-68-8	9E-05		D					7.2			0.00315		0.002	
thallium (I) carbonate	6533-73-9	8E-05		D					6.4			0.0028		0.002	
thallium (I) chloride	7791-12-0	8E-05		D					6.4			0.0028		0.002	
thallium (I) nitrate	10102-45-1	8E-05		D					7.2			0.00315		0.002	
thallium (I) sulfate	7446-18-6	8E-05		D					6.4			0.0028		0.002	
thallium selenite	12039-52-0	9E-05		D					7.2			0.00315		0.002	
thiobencarb	28249-77-6	0.01		NA					800			0.35			
thiofanox	39196-18-4	0.0003		NA					24			0.0105			
thiophanate-methyl	23564-05-8			NA											
thiram	137-26-8	0.005		NA					400			0.175			
tin	7440-31-5	0.6		NA					48000		21				
toluene	108-88-3	0.2	0.4 D	D					16000		7		1		
toluene diisocyanate, 2,4-	NO CAS RN			NA											
toluene, 2,3-diamino	2687-25-4			NA											
toluene, 2,3-dinitro	602-01-7			NA											
toluene, 2,4,6-trinitro	118-96-7	0.0005		C	0.03			40	233.333		0.0175	0.0167			
toluene, 2,4-diamino	95-80-7			B2	3.2				0.21875			1.1E-05			
toluene, 2,4-dinitro	121-14-2	0.002		B2	0.68			180	1.02941		0.07	5.1E-05			
toluene, 2,5-diamino	95-70-5	0.6		NA				48000			21				
toluene, 2,5-dinitro	619-15-8			NA											
toluene, 2,6-diamino	823-40-5	0.2		NA				16000			7				
toluene, 2,6-dinitro	606-20-2	0.001		B2	0.68			80	1.02941		0.035	5.1E-05			
toluene, 3,4-diamino	496-72-0			NA											
toluene, 3,4-dinitro	610-39-9			NA											
toluene, m-chloro	108-41-8			NA											
toluene, m-ethyl	620-14-4			NA											
toluene, o-chloro	95-49-8	0.02		NA				1600			0.7				
toluene, o-ethyl	611-14-3			NA											
toluene, p-chloro	106-43-4			NA											
toluene, p-ethyl	622-96-8			NA											
toluidine, m-	108-44-1			NA											
toluidine, p-	106-49-0			C	0.19			36.8421				0.00184			
toxaphene	8001-35-2			B2	1.1	0.00032		0.63636		0.0031		3.2E-05	0.003	0.73	0.0002
tralomethrin	66841-25-6	0.0075		NA				600			0.2625				
triallate	2303-17-5	0.013		NA				1040			0.455				
triasulfuron	82097-50-5	0.01		NA				800			0.35				
tribromochloromethane	594-15-0			D											
tribromodiphenyl ether	49690-94-0			D											
tributyltin oxide	56-35-9	3E-05		NA				2.4			0.00105				
trichlorocyclopentadiene	77323-84-3			D											
trichloroethane	79-01-6			NA									0.005		
trichlorofluoromethane	75-69-4	0.3	0.7	NA				24000		700	10.5				
trichloropropane, 1,1,1-	7789-89-1			NA											
trichloropropane, 1,1,2-	598-77-6	0.005		NA				400			0.175				
trichloropropane, 1,2,2-	3175-23-3			NA											

Sub Part S Action Levels - April 15, 1994														
	CAS #	Oral RfD mg/kg-d	Inh RfC mg/m3	Wt. of Evid.	Oral SF (mg/kg-d)-1	Inh. Unit Risk (ug/m3)-1	Soil Action Levels		Air Action Level		Water Action Level		MCL	AWQC - FW
Chemical							non carc. mg/kg	carc. mg/kg	non car ug/m3	carc. ug/m3	non carc. mg/L	carc. mg/L	mg/L	ug/L
trichloropropane, 1,2,3-	96-18-4	0.006		B2				480	--	--	0.21	--		
trichloropropane, 1,2,3-	96-19-5	0.005		NA				400	--	--	0.175	--		
trichlorotoluene, 2,3,6-	2077-46-5			NA				--	--	--	--	--		
trichlorotoluene, alpha,2,6-	2014-83-7			NA				--	--	--	--	--		
tricrosol	1319-77-3			NA				--	--	--	--	--		
tridiphane	58138-08-2			NA				--	--	--	--	--		
triethylamine	121-44-8		0.007	NA				--	--	7	--	--		
trifluoroethane, 1,1,1-	420-46-2			NA				--	--	--	--	--		
trifluoromethane	75-46-7			NA				--	--	--	--	--		
trifluralin	1582-09-8	0.0075		C	0.0077		600	909.091	--	--	0.2625	0.04545		
trimethyl phosphate	512-56-1			B2	0.037		--	18.9189	--	--	--	--	0.00095	
trimethylpentane, 2,2,4-	540-84-1			NA				--	--	--	--	--		
trinitrophenylmethylnitramine	478-45-8	0.01		NA			800	--	--	--	0.35	--		
uranium, natural	7440-61-1			NA			--	--	--	--	--	--		
uranium, soluble salts	NO CASRN	0.003		NA			240	--	--	--	0.105	--		
urea, n,n-dimethyl	598-94-7			NA			--	--	--	--	--	--		
vanadium	7440-62-2	0.007		NA			560	--	--	--	0.245	--		
vanadium pentoxide	1314-62-1	0.009		NA			720	--	--	--	0.315	--		
vanadium sulfate	36907-42-3	0.02		NA			1600	--	--	--	0.7	--		
vernarn	1929-77-7	0.001		NA			80	--	--	--	0.035	--		
vinclozolin	50471-44-8			NA			--	--	--	--	--	--		
vinyl acetate	108-05-4	1	0.2	NA			80000	--	200	--	35	--		
vinyl bromide	593-60-2		0.003	B2		0.000032	--	--	3	0.0313	--	--		
vinyl chloride	75-01-4			A	1.9	0.000084	--	0.36842	--	0.0119	--	--	1.8E-05	0.002
warfarin	81-81-2	0.0003		NA			24	--	--	--	0.0105	--		
xylene, 4-ethyl-o-	934-80-5			NA			--	--	--	--	--	--		
xylene, m-	108-30-3	2		NA			160000	--	--	--	70	--	10	
xylene, mixture	1330-20-7	2		D			160000	--	--	--	70	--	10	
xylene, o-	95-47-6	2		NA			160000	--	--	--	70	--	10	
xylene, p-	106-42-3			NA			--	--	--	--	--	--	10	
zinc	7440-66-6	0.3		D			24000	--	--	--	10.5	--		120
zinc cyanide	557-21-1	0.05		NA			4000	--	--	--	1.75	--		110
zinc phosphide	1314-84-7	0.0003		NA			24	--	--	--	0.0105	--		
zineb	12122-67-7	0.05		NA			4000	--	--	--	1.75	--		

**Attachment B**

**EPA Region III RBCs**

Sources: I=IRIS h=HEAST a=HEAST alt. w=Withdrawn from IRIS or HEAST e=EPA-EC10 provisional a=Other EPA documents

Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects.

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSO kg/d/mg	CPSi kg/d/mg	V	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Acephate	30560191	4.00E-03	2.57E-03	8.70E-03	7.70E-03	I	7.7 c	0.72 c	0.36 c	330 c	73 c
Acetaldehyde	75070						94 n	0.81 c			
Acetochlor	34256821	2.00E-02					730 n	73 n	27 n	20000 n	1600 n
Acetone	67641	1.00E-01					3700 n	370 n	140 n	100000 n	7800 n
Acetone cyanohydrin	75865	7.00E-02 h	2.86E-03 a				2600 n	10 n	95 n	72000 n	5500 n
Acetonitrile	75078	6.00E-03	1.43E-02 a				220 n	52 n	8.1 n	6100 n	470 n
Acetophenone	98862	1.00E-01	5.71E-06 w			***	0.042 n	0.021 n	140 n	100000 n	7800 n
Acifluorfen	62476599	1.30E-02					470 n	47 n	18 n	13000 n	1000 n
Acrolein	107028	2.00E-02 h	5.71E-06				730 n	0.021 n	27 n	20000 n	1600 n
Acrylamide	79061	2.00E-04		4.50E+00	4.55E+00	I	0.015 c	0.0014 c	0.0007 c	0.64 c	0.14 c
Acrylic acid	79107	5.00E-01	1.00E-03				18000 n	3.7 n	680 n	510000 n	39000 n
Acrylonitrile	107131	1.00E-03 h	5.71E-04	5.40E-01	2.38E-01	I	0.12 c	0.026 c	0.0058 c	5.3 c	1.2 c
Alachlor	15972608	1.00E-02		8.00E-02 h			0.84 c	0.078 c	0.039 c	36 c	8 c
Alar	1596845	1.50E-01					5500 n	550 n	200 n	150000 n	12000 n
Aldicarb	116063	1.00E-03					37 n	3.7 n	1.4 n	1000 n	78 n
Aldicarb sulfone	1646884	1.00E-03					37 n	3.7 n	1.4 n	1000 n	78 n
Aldrin	309002	3.00E-05		1.70E+01	1.71E+01	I	0.004 c	0.00037 c	0.00019 c	0.17 c	0.038 c
Allyl	74223646	2.50E-01					9100 n	910 n	340 n	260000 n	20000 n
Allyl alcohol	107186	5.00E-03					180 n	18 n	6.8 n	5100 n	390 n
Allyl chloride	107051	5.00E-02 w	2.86E-04				1800 n	1 n	68 n	51000 n	3900 n
Aluminum	7429905	1.00E+00 a					37000 a	3700 a	1400 a	1000000 a	78000 a
Aluminum phosphide	20859738	4.00E-04					15 n	1.5 n	0.54 n	410 n	31 n
Amdro	67485294	3.00E-04					11 n	1.1 n	0.41 n	310 n	23 n
Ametryn	834128	9.00E-03					330 n	33 n	12 n	9200 n	700 n
m-Aminophenol	591275	7.00E-02 h					2600 n	260 n	95 n	72000 n	5500 n
4-Aminopyridine	504245	2.00E-05 h					0.73 n	0.073 n	0.027 n	20 n	1.6 n
Amitraz	33089611	2.50E-03					91 n	9.1 n	3.4 n	2600 n	200 n
Ammonia	7664417		2.86E-02				1000 n	100 n			
Ammonium sulfamate	7773060	2.00E-01		5.70E-03			7300 n	730 n	270 n	200000 n	16000 n
Aniline	62533		2.86E-04				10 n	1 n	0.55 c	500 c	110 c
Antimony and compounds	7440360	4.00E-04					15 n	1.5 n	0.54 n	410 n	31 n
Antimony pentoxide	1314609	5.00E-04 h					18 n	1.8 n	0.68 n	510 n	39 n
Antimony potassium tartrate	304610	9.00E-04 h					33 n	3.3 n	1.2 n	920 n	70 n
Antimony tetroxide	1332316	4.00E-04 h					15 n	1.5 n	0.54 n	410 n	31 n
Antimony trioxide	1309644	4.00E-04 h					15 n	1.5 n	0.54 n	410 n	31 n
Apollo	74115245	1.30E-02					470 n	47 n	18 n	13000 n	1000 n
Aramite	140578	5.00E-02 h		2.50E-02	2.49E-02	I	2.7 c	0.25 c	0.13 c	110 c	26 c
Arsenic	7440382	3.00E-04					11 n	1.1 n	0.41 n	310 n	23 n
Arsenic (as carcinogen)	7440382			1.75E+00	1.51E+01	I	0.038 c	0.00041 c	0.0018 c	1.6 c	0.37 c
Arsine	7784421		1.43E-05				0.52 n	0.052 n			
Assure	76578148	9.00E-03					330 n	33 n	12 n	9200 n	700 n
Asulam	3337711	5.00E-02					1800 n	180 n	68 n	51000 n	3900 n



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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg/d/mg	CPSi kg/d/mg	V	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Atrazine	191249	3.50E-02 f		2.22E-01 h			0.3 c	0.028 c	0.014 c	13 c	2.9 c
Avermectin B1	65195553	4.00E-04 f					15 n	1.5 n	0.54 n	410 n	31 n
Azobenzene	103333			1.10E-01 f	1.08E-01 f		0.61 c	0.058 c	0.029 c	26 c	5.8 c
Barium and compounds	7440393	7.00E-02 f	1.43E-04 a				2600 n	0.52 n	95 n	72000 n	5500 n
Baygon	114261	4.00E-03 f					150 n	15 n	5.4 n	4100 n	310 n
Bayleton	43121439	3.00E-02 f					1100 n	110 n	41 n	31000 n	2300 n
Baythroid	68359375	2.50E-02 f					910 n	91 n	34 n	26000 n	2000 n
Benefin	1861401	3.00E-01 f					11000 n	1100 n	410 n	310000 n	23000 n
Benomyl	17804352	5.00E-02 f					1800 n	180 n	68 n	51000 n	3900 n
Bentazon	25057890	2.50E-03 f				...	91 n	9.1 n	3.4 n	2600 n	200 n
Benzaldehyde	100527	1.00E-01 f				...	610 n	370 n	140 n	100000 n	7800 n
Benzene	71432		1.71E-03 a	2.90E-02 f	2.90E-02 f	...	0.36 c	0.22 c	0.11 c	99 c	22 c
Benzenethiol	108985	1.00E-05 h					0.37 n	0.037 n	0.014 n	10 n	0.78 n
Benzidine	92875	3.00E-03 f		2.30E-02 f	2.35E-02 f		0.00029 c	0.000027 c	0.000014 c	0.012 c	0.0028 c
Benzoic acid	65850	4.00E-00 f					150000 n	15000 n	5400 n	1000000 n	310000 n
Benzotrithloride	98077			1.30E-01 f			0.0052 c	0.00048 c	0.00024 c	0.22 c	0.049 c
Benzyl alcohol	100516	3.00E-01 h					11000 n	1100 n	410 n	310000 n	23000 n
Benzyl chloride	100447			1.70E-01 f		...	0.062 c	0.037 c	0.019 c	17 c	3.8 c
Beryllium and compounds	7440417	5.00E-03 f		4.30E-00 f	8.40E-00 f		0.016 c	0.00075 c	0.00073 c	0.67 c	0.15 c
Bidrin	141662	1.00E-04 f					3.7 n	0.37 n	0.14 n	100 n	7.8 n
Biphenrin (Talstar)	82657043	1.50E-02 f					550 n	55 n	20 n	15000 n	1200 n
1,1-Biphenyl	92524	5.00E-02 f					1800 n	180 n	68 n	51000 n	3900 n
Bis(2-chloroisopropyl)ether	39638329	4.00E-02 f		7.00E-02 h	3.50E-02 h	...	0.26 c	0.18 c	0.045 c	41 c	9.1 c
Bis(chloromethyl)ether	542881			2.20E-02 f	2.17E-02 f	...	0.000049 c	0.000029 c	0.000014 c	0.013 c	0.0029 c
Bis(2-chloro-1-methylethyl)ether				7.00E-02 w	7.00E-02 w		0.96 c	0.089 c	0.045 c	41 c	9.1 c
Bis(2-ethylhexyl)phthalate (DEHP)	117817	2.00E-02 f		1.40E-02 f			4.8 c	0.45 c	0.23 c	200 c	46 c
Bis(chloroethyl)ether	111444			1.10E-00 f	1.16E-00 f	...	0.0092 c	0.0054 c	0.0029 c	2.6 c	0.58 c
Bisphenol A	80057	5.00E-02 f					1800 n	180 n	68 n	51000 n	3900 n
Boron (and borates)	7440428	9.00E-02 f	5.71E-03 h				3300 n	21 n	120 n	92000 n	7000 n
Boron trifluoride	7637072		2.00E-04 h				7.3 n	0.73 n			
Bromodichloromethane	75274	2.00E-02 f		6.20E-02 f		...	0.17 c	0.1 c	0.051 c	46 c	10 c
Bromoethene	593602				1.10E-01 h	...	0.096 c	0.057 c			
Bromoform (tribromomethane)	75252	2.00E-02 f		7.90E-03 f	3.85E-03 f	...	2.4 c	1.6 c	0.4 c	360 c	81 c
Bromomethane	74839	1.40E-03 f	1.43E-03 f			...	8.7 n	5.2 n	1.9 n	1400 n	110 n
4-Bromophenyl phenyl ether	101553	5.80E-02 a					2100 n	210 n	78 n	59000 n	4500 n
Bromophos	2104963	5.00E-03 h					180 n	18 n	6.8 n	5100 n	390 n
Bromoxynil	1689845	2.00E-02 f					730 n	73 n	27 n	20000 n	1600 n
Bromoxynil octanoate	1689992	2.00E-02 f					730 n	73 n	27 n	20000 n	1600 n
1,3-Butadiene	106990				9.80E-01 f	...	0.011 c	0.0064 c			
1-Butanol	71363	1.00E-01 f					3700 n	370 n	140 n	100000 n	7800 n
Butyl benzyl phthalate	85687	2.00E-01 f					7300 n	730 n	270 n	200000 n	16000 n
Butylate	2008415	5.00E-02 f					1800 n	180 n	68 n	51000 n	3900 n

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Contaminant	CAS	RfDo mg/kg/d	RfDI mg/kg/d	CPSO kg/d/mg	CPSi kg/d/mg	V	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
sec-Butylbenzene	135988	1.00E-02 •				***	61 n	37 n	14 n	10000 n	780 n
tert-Butylbenzene	104518	1.00E-02 •				***	61 n	37 n	14 n	10000 n	780 n
Butylphthalyl butylglycolate	85701	1.00E+00 /					37000 n	3700 n	1400 n	1000000 n	78000 n
Cacodylic acid	75605	3.00E-03 h					110 n	11 n	4.1 n	3100 n	230 n
Cadmium and compounds	7440439	5.00E-04 /		6.30E+00 /			18 n	0.00099 c	0.68 n	510 n	39 n
Caprolactam	105602	5.00E-01 /					18000 n	1800 n	680 n	510000 n	39000 n
Captadol	2425061	2.00E-03 /		8.60E-03 h			7.8 c	0.73 c	0.37 c	330 c	74 c
Captan	133062	1.30E-01 /		3.50E-03 h			19 c	1.8 c	0.9 c	820 c	180 c
Carbaryl	63252	1.00E-01 /					3700 n	370 n	140 n	100000 n	7800 n
Carbazole	86748			2.00E-02 h			3.4 c	0.31 c	0.16 c	140 c	32 c
Carbofuran	1563662	5.00E-03 /					180 n	18 n	6.8 n	5100 n	390 n
Carbon disulfide	75150	1.00E-01 /	2.86E-03 h			***	21 n	10 n	140 n	100000 n	7800 n
Carbon tetrachloride	56235	7.00E-04 /	5.71E-04 •	1.30E-01 /	5.25E-02 /	***	0.16 c	0.12 c	0.024 c	22 c	4.9 c
Carbosulfan	55285148	1.00E-02 /					370 n	37 n	14 n	10000 n	780 n
Carboxin	5234684	1.00E-01 /					3700 n	370 n	140 n	100000 n	7800 n
Chloral	75876	2.00E-03 /					73 n	7.3 n	2.7 n	2000 n	160 n
Chloramben	133904	1.50E-02 /					550 n	55 n	20 n	15000 n	1200 n
Chloranil	118752			4.03E-01 h			0.17 c	0.016 c	0.0078 c	7.1 c	1.6 c
Chlorane	57749	6.00E-05 /		1.30E+00 /	1.29E+00 /		0.052 c	0.0049 c	0.0024 c	2.2 c	0.49 c
Chlorimuron-ethyl	90982324	2.00E-02 /					730 n	73 n	27 n	20000 n	1600 n
Chlorine	7782505	1.00E-01 /					3700 n	370 n	140 n	100000 n	7800 n
Chlorine dioxide	10049044		5.71E-05 /				2.1 n	0.21 n			
Chloroacetaldehyde	107200	6.90E-03 o					250 n	25 n	9.3 n	7100 n	540 n
Chloroacetic acid	79118	2.00E-03 h					73 n	7.3 n	2.7 n	2000 n	160 n
2-Chloroacetophenone	532274		8.57E-06 /				0.31 n	0.031 n			
4-Chloroaniline	106478	4.00E-03 /					150 n	15 n	5.4 n	4100 n	310 n
Chlorobenzene	108907	2.00E-02 /	5.71E-03 •			***	39 n	21 n	27 n	20000 n	1600 n
Chlorobenzilate	510156	2.00E-02 /		2.70E-01 h	2.70E-01 h		0.25 c	0.023 c	0.012 c	11 c	2.4 c
p-Chlorobenzoic acid	74113	2.00E-01 h					7300 n	730 n	270 n	20000 n	16000 n
4-Chlorobenzotrifluoride	98566	2.00E-02 h					730 n	73 n	27 n	20000 n	1600 n
2-Chloro-1,3-butadiene	126998	2.00E-02 •	2.00E-03 h			***	14 n	7.3 n	27 n	20000 n	1600 n
1-Chlorobutane	109693	4.00E-01 h				***	2400 n	1500 n	540 n	410000 n	31000 n
Chlorodifluoromethane	75456		1.43E+01 /			***	87000 n	52000 n			
Chloroethane	75003	4.00E-01 •	2.86E+00 /			***	8600 n	10000 n	540 n	410000 n	31000 n
2-Chloroethyl vinyl ether	110758	2.50E-02 o				***	150 n	91 n	34 n	26000 n	2000 n
Chloroform	67663	1.00E-02 /		6.10E-03 /	8.05E-02 /	***	0.15 c	0.078 c	0.52 c	470 c	100 c
Chloromethane	74873			1.30E-02 h	6.30E-03 h	***	1.4 c	0.99 c	0.24 c	220 c	49 c
4-Chloro-2-methylaniline hydrochloride	3165933			4.60E-01 h			0.15 c	0.014 c	0.0069 c	6.2 c	1.4 c
4-Chloro-2-methylaniline	95692			5.80E-01 h			0.12 c	0.011 c	0.0054 c	4.9 c	1.1 c
beta-Chloronaphthalene	91587	8.00E-02 /				***	2900 n	290 n	110 n	82000 n	6300 n
o-Chloronitrobenzene	88733			2.50E-02 h		***	0.42 c	0.25 c	0.13 c	110 c	26 c
p-Chloronitrobenzene	100005			1.80E-02 h		***	0.59 c	0.35 c	0.18 c	160 c	35 c

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Contaminant	CAS	RfD mg/kg/d	MDL mg/kg/d	CPSO kg/d/mg	CPSI kg/d/mg	V	O	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
2-Chlorophenol	95578	5.00E-03 /	2.86E-02 h	1.10E-02 h		***		180 n	18 n	6.8 n	5100 n	390 n
2-Chloropropane	75296							170 n	100 n			
Chlorobenzene	1897456	1.50E-02 /						6.1 e	0.57 e	0.29 e	260 e	58 e
o-Chlorotoluene	95498	2.00E-02 /				***		120 n	73 n	27 n	20000 n	1600 n
Chloropropane	101213	2.00E-01 /						7300 n	730 n	270 n	200000 n	16000 n
Chlorpyrifos	2921882	3.00E-03 /						110 n	11 n	4.1 n	3100 n	230 n
Chlorpyrifos-methyl	5598130	1.00E-02 h						370 n	37 n	14 n	10000 n	780 n
Chlorosulfuron	64902723	5.00E-02 /						1800 n	180 n	68 n	51000 n	3900 n
Chlorothiophos	60238564	8.00E-04 h						29 n	2.9 n	1.1 n	820 n	63 n
Chromium III and compounds	16065831	1.00E+00 /	5.71E-07 w					37000 n	0.0021 n	1400 n	1000000 n	78000 n
Chromium VI and compounds	7440473	5.00E-03 /			4.20E+01 /			180 n	0.00015 e	6.8 n	5100 n	390 n
Coal tar	8001589				2.20E+00 w				0.0028 e			
Cobalt	7440484	6.00E-02 e						2200 n	220 n	81 n	61000 n	4700 n
Coke Oven Emissions	8007452				2.17E+00 /				0.0029 e			
Copper and compounds	7440508	3.71E-02 h						1400 n	140 n	50 n	38000 n	2900 n
Crotonaldehyde	123739	1.00E-02 w		1.90E+00 h	1.90E+00 w			0.035 e	0.0033 e	0.0017 e	1.5 e	0.34 e
Cumene	98828	4.00E-02 /	2.57E-03 h					1500 n	9.4 n	54 n	41000 n	3100 n
Cyanides:												
Barium cyanide	542621	1.00E-01 w						3700 n	370 n	140 n	100000 n	7800 n
Calcium cyanide	592018	4.00E-02 /						1500 n	150 n	54 n	41000 n	3100 n
Copper cyanide	544923	5.00E-03 /						180 n	18 n	6.8 n	5100 n	390 n
Cyanazine	21725462	2.00E-03 h		8.40E-01 h				0.08 e	0.0075 e	0.0038 e	3.4 e	0.76 e
Cyanogen	460195	4.00E-02 /						1500 n	150 n	54 n	41000 n	3100 n
Cyanogen bromide	506683	9.00E-02 /						3300 n	330 n	120 n	92000 n	7000 n
Cyanogen chloride	506774	5.00E-02 /						1800 n	180 n	68 n	51000 n	3900 n
Free cyanide	57125	2.00E-02 /						730 n	73 n	27 n	20000 n	1600 n
Hydrogen cyanide	74908	2.00E-02 /	8.57E-04 /					730 n	3.1 n	27 n	20000 n	1600 n
Potassium cyanide	151508	5.00E-02 /						1800 n	180 n	68 n	51000 n	3900 n
Potassium silver cyanide	506616	2.00E-01 /						7300 n	730 n	270 n	200000 n	16000 n
Silver cyanide	506649	1.00E-01 /						3700 n	370 n	140 n	100000 n	7800 n
Sodium cyanide	143339	4.00E-02 /						1500 n	150 n	54 n	41000 n	3100 n
Zinc cyanide	557211	5.00E-02 /						1800 n	180 n	68 n	51000 n	3900 n
Cyclohexanone	108941	5.00E+00 /				***		30000 n	18000 n	6800 n	1000000 n	390000 n
Cyclohexylamine	108918	2.00E-01 /						7300 n	730 n	270 n	200000 n	16000 n
Cyhalothrin/Karate	68085858	5.00E-03 /						180 n	18 n	6.8 n	5100 n	390 n
Cypermethrin	52315078	1.00E-02 /						370 n	37 n	14 n	10000 n	780 n
Cyromazine	66215278	7.50E-03 /						270 n	27 n	10 n	7700 n	590 n
Dacthal	1861321	1.00E-02 /						370 n	37 n	14 n	10000 n	780 n
Dalapon	75990	3.00E-02 /						1100 n	110 n	41 n	31000 n	2300 n
Danitrol	39515418	2.50E-02 /						210 n	21 n	34 n	26000 n	2000 n
DDD	72548			2.40E-01 /				0.28 e	0.026 e	0.013 e	12 e	2.7 e
DDE	72559			3.40E-01 /				0.2 e	0.018 e	0.0093 e	8.4 e	1.9 e

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Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects.

Contaminant	CAS	RfD <sub>o</sub> mg/kg/d	RfD <sub>i</sub> mg/kg/d	CPS <sub>o</sub> kg/d/mg	CPS <sub>i</sub> kg/d/mg	V	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
DDT	50293	5.00E-04 /		3.40E-01 /	3.40E-01 /	***	0.2 c	0.018 c	0.0093 c	8.4 c	1.9 c
Decabromodiphenyl ether	1163195	1.00E-02 /				***	61 n	37 n	14 n	10000 n	780 n
Demeton	8065483	4.00E-05 /				***	1.5 n	0.15 n	0.054 n	41 n	3.1 n
Diallate	2303164			6.10E-02 h		***	0.17 c	0.1 c	0.052 c	47 c	10 c
Diazinon	333415	9.00E-04 h				***	33 n	3.3 n	1.2 n	920 n	70 n
Dibenzofuran	132649	4.00E-03 g				***	150 n	15 n	5.4 n	4100 n	310 n
1,4-Dibromobenzene	106376	1.00E-02 /		8.40E-02 /		***	61 n	37 n	14 n	10000 n	780 n
Dibromochloromethane	124481	2.00E-02 /				***	0.13 c	0.075 c	0.038 c	34 c	7.6 c
1,2-Dibromo-3-chloropropane	96128		5.71E-05 /	1.40E+00 h	2.42E-03 h	***	0.048 c	0.21 n	0.0023 c	2 c	0.46 c
1,2-Dibromoethane	106934		5.71E-05 h	8.50E+01 /	7.70E-01 /	***	0.00075 c	0.0081 c	0.000037 c	0.034 c	0.0075 c
Dibutyl phthalate	84742	1.00E-01 /				***	3700 n	370 n	140 n	100000 n	7800 n
Dicamba	1918009	3.00E-02 /				***	1100 n	110 n	41 n	31000 n	2300 n
1,2-Dichlorobenzene	95501	9.00E-02 /	5.71E-02 g			***	370 n	210 n	120 n	92000 n	7000 n
1,3-Dichlorobenzene	541731	8.90E-02 o				***	540 n	320 n	120 n	91000 n	7000 n
1,4-Dichlorobenzene	106467		2.29E-01 /	2.40E-02 h		***	0.44 c	0.26 c	0.13 c	120 c	27 c
3,3'-Dichlorobenzidine	91941			4.50E-01 /		***	0.15 c	0.014 c	0.007 c	6.4 c	1.4 c
1,4-Dichloro-2-butene	764410		5.71E-02 g		9.30E+00 h	***	0.0011 c	0.00067 c			
Dichlorodifluoromethane	75718	2.00E-01 /	5.71E-02 g			***	390 n	210 n	270 n	200000 n	16000 n
1,1-Dichloroethane	75343	1.00E-01 h	1.43E-01 g			***	810 n	520 n	140 n	100000 n	7800 n
1,2-Dichloroethane (EDC)	107062		2.86E-03 g	9.10E-02 /	9.10E-02 /	***	0.12 c	0.069 c	0.035 c	31 c	7 c
1,1-Dichloroethylene	75354	9.00E-03 /		6.00E-01 /	1.75E-01 /	***	0.044 c	0.036 c	0.0053 c	4.8 c	1.1 c
1,2-Dichloroethylene (cis)	156592	1.00E-02 h				***	61 n	37 n	14 n	10000 n	780 n
1,2-Dichloroethylene (trans)	156605	2.00E-02 /				***	120 n	73 n	27 n	20000 n	1600 n
1,2-Dichloroethylene (mixture)	540590	9.00E-03 h				***	55 n	33 n	12 n	9200 n	700 n
2,4-Dichlorophenol	120832	3.00E-03 /				***	110 n	11 n	4.1 n	3100 n	230 n
2,4-Dichlorophenoxyacetic Acid (2,4-D)	94757	1.00E-02 /				***	61 n	37 n	14 n	10000 n	780 n
4-(2,4-Dichlorophenoxy)butyric Acid	94826	8.00E-03 /				***	290 n	29 n	11 n	8200 n	630 n
1,2-Dichloropropane	78875		1.14E-03 /	6.80E-02 h		***	0.16 c	0.092 c	0.046 c	42 c	9.4 c
2,3-Dichloropropanol	616239	3.00E-03 /				***	110 n	11 n	4.1 n	3100 n	230 n
1,3-Dichloropropene	542756	3.00E-04 /	5.71E-03 /	1.75E-01 h	1.30E-01 h	***	0.077 c	0.048 c	0.018 c	16 c	3.7 c
Dichlorvos	62737	5.00E-04 /	1.43E-04 /	2.90E-01 /		***	0.23 c	0.022 c	0.011 c	9.9 c	2.2 c
Dicofof	115322			4.40E-01 w		***	0.15 c	0.014 c	0.0072 c	6.5 c	1.5 c
Dicyclopentadiene	77736	3.00E-02 h	5.71E-05 g			***	0.42 n	0.21 n	41 n	31000 n	2300 n
Dieldrin	60571	5.00E-05 /		1.60E-01 /	1.61E-01 /	***	0.0042 c	0.00039 c	0.0002 c	0.18 c	0.04 c
Diesel emissions	84662	8.00E-01 /	1.43E-03 /			***	52 n	5.2 n			
Diethyl phthalate	112345		5.71E-03 h			***	2900 n	2900 n	1100 n	820000 n	63000 n
Diethylene glycol, monobutyl ether	111900	2.00E-00 h				***	210 n	21 n			
Diethylene glycol, monoethyl ether	617845	1.10E-02 h				***	73000 n	7300 n	2700 n	1000000 n	160000 n
Diethylformamide	103231	6.00E-01 /		1.20E-03 /		***	400 n	40 n	15 n	11000 n	860 n
Di(2-ethylhexyl)adipate	56531			4.70E-03 h		***	56 c	5.2 c	2.6 c	2400 c	330 c
Diethylstilbestrol	43222486	8.00E-02 /				***	0.000014 c	1.30E-06 c	6.70E-07 c	0.00061 c	0.00014 c
Difenzoquat (Avenge)						***	2900 n	290 n	110 n	82000 n	6300 n

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg-d/mg	CPSi kg-d/mg	V O	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Diflufenuron	35367385	2.00E-02 /					730 n	73 n	27 n	20000 n	1600 n
1,1-Difluoroethane	75376		1.14E+01 /			**	69000 n	43000 n			
Diisopropyl methylphosphonate (DIMP)	1445756	8.00E-02 /					2900 n	290 n	110 n	82000 n	6300 n
Dimethipin	55290647	2.00E-02 /					730 n	73 n	27 n	20000 n	1600 n
Dimethoate	60515	2.00E-04 /					7.3 n	0.73 n	0.27 n	200 n	16 n
3,3'-Dimethoxybenzidine	119904		1.40E-02 h				4.8 c	0.45 c	0.23 c	200 c	46 c
Dimethyl phthalate	131113	1.00E+01 h					370000 n	37000 n	14000 n	1000000 n	780000 n
Dimethyl terephthalate	120616	1.00E-01 /					3700 n	370 n	140 n	100000 n	7800 n
Dimethylamine	124403		5.71E-06 w				0.21 n	0.021 n			
2,4-Dimethylaniline hydrochloride	21436964			5.80E-01 h			0.12 c	0.011 c	0.0054 c	4.9 c	1.1 c
2,4-Dimethylaniline	95681			7.50E-01 h			0.09 c	0.0083 c	0.0042 c	3.8 c	0.85 c
N,N-Dimethylaniline	121697	2.00E-03 /					73 n	7.3 n	2.7 n	2000 n	160 n
3,3'-Dimethylbenzidine	119937			9.20E+00 h			0.0073 c	0.00068 c	0.00034 c	0.31 c	0.069 c
N,N-Dimethylformamide	68122	1.00E-01 h	8.57E-03 /				3700 n	31 n	140 n	100000 n	7800 n
1,1-Dimethylhydrazine	57147			2.60E+00 w	3.50E+00 w		0.026 c	0.0018 c	0.0012 c	1.1 c	0.25 c
1,2-Dimethylhydrazine	540738			3.70E+01 w	3.70E+01 w		0.0018 c	0.00017 c	0.000085 c	0.077 c	0.017 c
2,4-Dimethylphenol	105679	2.00E-02 /					730 n	73 n	27 n	20000 n	1600 n
2,6-Dimethylphenol	576261	6.00E-04 /					22 n	2.2 n	0.81 n	610 n	47 n
3,4-Dimethylphenol	95658	1.00E-03 /					37 n	3.7 n	1.4 n	1000 n	78 n
1,2-Dinitrobenzene	528290	4.00E-04 h					15 n	1.5 n	0.54 n	410 n	31 n
1,3-Dinitrobenzene	99650	1.00E-04 /					3.7 n	0.37 n	0.14 n	100 n	7.8 n
1,4-Dinitrobenzene	100254	4.00E-04 h					15 n	1.5 n	0.54 n	410 n	31 n
4,6-Dinitro-o-cyclohexyl phenol	131895	2.00E-03 /					73 n	7.3 n	2.7 n	2000 n	160 n
2,4-Dinitrophenol	51285	2.00E-03 /					73 n	7.3 n	2.7 n	2000 n	160 n
Dinitrotoluene mixture				6.80E-01 /			0.099 c	0.0092 c	0.0046 c	4.2 c	0.94 c
2,4-Dinitrotoluene	121142	2.00E-03 /					73 n	7.3 n	2.7 n	2000 n	160 n
2,6-Dinitrotoluene	606202	1.00E-03 h					37 n	3.7 n	1.4 n	1000 n	78 n
Dinoseb	88857	1.00E-03 /					37 n	3.7 n	1.4 n	1000 n	78 n
di-n-Octyl phthalate	117840	2.00E-02 h					730 n	73 n	27 n	20000 n	1600 n
1,4-Dioxane	123911			1.10E-02 /			6.1 c	0.57 c	0.29 c	260 c	58 c
Diphenamid	957517	3.00E-02 /					1100 n	110 n	41 n	31000 n	2300 n
Diphenylamine	122394	2.50E-02 /					910 n	91 n	34 n	26000 n	2000 n
1,2-Diphenylhydrazine	122667			8.00E-01 /	7.70E-01 /		0.084 c	0.0081 c	0.0039 c	3.6 c	0.8 c
Diquat	85007	2.20E-03 /					80 n	8 n	3 n	2200 n	170 n
Direct black 38	1937377			8.60E+00 h			0.0078 c	0.00073 c	0.00037 c	0.33 c	0.074 c
Direct blue 6	2602462			8.10E+00 h			0.0083 c	0.00077 c	0.00039 c	0.35 c	0.079 c
Direct brown 95	16071866			9.30E+00 h			0.0072 c	0.00067 c	0.00034 c	0.31 c	0.069 c
Dialufon	298044	4.00E-05 /					1.5 n	0.15 n	0.054 n	41 n	3.1 n
1,4-Dithiane	505293	1.00E-02 /					370 n	37 n	14 n	10000 n	780 n
Diuron	330541	2.00E-03 /					73 n	7.3 n	2.7 n	2000 n	160 n
Dodine	2439103	4.00E-03 /					150 n	15 n	5.4 n	4100 n	310 n
Endosulfan	115297	6.00E-03 /					220 n	22 n	8.1 n	6100 n	470 n

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg d/mg	CPSi kg d/mg	Y	O	C	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Endothall	145733	2.00E-02 /							730 n	73 n	27 n	20000 n	1600 n
Endrin	72208	3.00E-04 /							11 n	1.1 n	0.41 n	310 n	23 n
Epichlorohydrin	106898	2.00E-03 h	2.86E-04 /	9.90E-03 /	4.20E-03 /				6.8 c	1 n	0.32 c	290 c	65 c
1,2-Epoxybutane	106887		5.71E-03 /						210 n	21 n			
Ethephon (2-chloroethyl phosphonic acid)	16672870	5.00E-03 /							180 n	18 n	6.8 n	5100 n	390 n
Ethion	563122	5.00E-04 /							18 n	1.8 n	0.68 n	510 n	39 n
2-Ethoxyethanol acetate	111159	3.00E-01 *							11000 n	1100 n	410 n	310000 n	23000 n
2-Ethoxyethanol	110805	4.00E-01 h	5.71E-02 /						15000 n	210 n	540 n	410000 n	31000 n
Ethyl acrylate	140885			4.80E-02 h					1.4 c	0.13 c	0.066 c	60 c	13 c
EPTC (S-Ethyl dipropylthiocarbamate)	759944	2.50E-02 /							910 n	91 n	34 n	26000 n	2000 n
Ethyl ether	60297	2.00E-01 /				***			1200 n	730 n	270 n	200000 n	16000 n
Ethyl methacrylate	97632	9.00E-02 h							3300 n	330 n	120 n	92000 n	7000 n
Ethyl acetate	141786	9.00E-01 /							33000 n	3300 n	1200 n	920000 n	70000 n
Ethylbenzene	100414	1.00E-01 /	2.86E-01 /			***			1300 n	1000 n	140 n	100000 n	78000 n
Ethylene cyanohydrin	109784	3.00E-01 h							11000 n	1100 n	410 n	310000 n	23000 n
Ethylene diamine	107153	2.00E-02 h							730 n	73 n	27 n	20000 n	1600 n
Ethylene glycol	107211	2.00E-00 /							73000 n	7300 n	2700 n	1000000 n	160000 n
Ethylene glycol, monobutyl ether	111762		5.71E-03 h						210 n	21 n			
Ethylene oxide	75218			1.02E+00 h	3.50E-01 h				0.066 c	0.018 c	0.0031 c	2.8 c	0.63 c
Ethylene thiourea (ETU)	96457	8.00E-05 /		1.19E-01 h					0.57 c	0.053 c	0.027 c	24 c	5.4 c
Ethyl p-nitrophenyl phenylphosphorothioate	2104645	1.00E-05 /							0.37 n	0.037 n	0.014 n	10 n	0.78 n
Ethyl nitrosourea	759739			1.40E-02 w					0.00048 c	0.000045 c	0.000023 c	0.02 c	0.0046 c
Ethylphthalyl ethyl glycolate	84720	3.00E+00 /							110000 n	11000 n	4100 n	1000000 n	230000 n
Express	10120	8.00E-03 /							290 n	29 n	11 n	8200 n	630 n
Fenamiphos	22224926	2.50E-04 /							9.1 n	0.91 n	0.34 n	260 n	20 n
Fluometuron	2164172	1.30E-02 /							470 n	47 n	18 n	13000 n	1000 n
Fluoride	7782414	6.00E-02 /							2200 n	220 n	81 n	61000 n	4700 n
Fluoridone	59756604	8.00E-02 /							2900 n	290 n	110 n	82000 n	6300 n
Flurprimidol	56425913	2.00E-02 /							730 n	73 n	27 n	20000 n	1600 n
Flutolanil	66332965	6.00E-02 /							2200 n	220 n	81 n	61000 n	4700 n
Fluvalinate	69409945	1.00E-02 /							370 n	37 n	14 n	10000 n	780 n
Folpet	133073	1.00E-01 /		3.50E-03 /					19 c	1.8 c	0.9 c	820 c	180 c
Fomesafen	72178020			1.90E-01 /					0.35 c	0.033 c	0.017 c	15 c	3.4 c
Fonofos	944229	2.00E-03 /							73 n	7.3 n	2.7 n	2000 n	160 n
Formaldehyde	50000	2.00E-01 /			4.55E-02 /				7300 n	0.14 c	270 n	200000 n	16000 n
Formic Acid	64186	2.00E+00 h							73000 n	7300 n	2700 n	1000000 n	160000 n
Fosetyl-al	39148248	3.00E+00 /							110000 n	11000 n	4100 n	1000000 n	230000 n
Furan	110009	1.00E-03 /							37 n	3.7 n	1.4 n	1000 n	78 n
Furazolidone	67458			3.80E+00 h					0.018 c	0.0016 c	0.00083 c	0.75 c	0.17 c
Furfural	98011	3.00E-03 /	1.43E-02 *						110 n	52 n	4.1 n	3100 n	230 n
Furium	531828			5.00E+01 h					0.0013 c	0.00013 c	0.000063 c	0.057 c	0.013 c
Furmecyclox	60568050			3.00E-02 /					2.2 c	0.21 c	0.11 c	95 c	21 c

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg/d/mg	CPSi kg/d/mg	V	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Glufosinate-ammonium	7718282	4.00E-04 /					15 n	1.5 n	0.54 n	410 n	31 n
Glycidaldehyde	765344	4.00E-04 /	2.86E-04 h				15 n	1 n	0.54 n	410 n	31 n
Glyphosate	1071836	1.00E-01 /					3700 n	370 n	140 n	10000 n	7800 n
Haloxyp-methyl	69806402	5.00E-05 /					1.8 n	0.18 n	0.068 n	51 n	3.9 n
Harmony	79277273	1.30E-02 /					470 n	47 n	18 n	13000 n	1000 n
HCH (alpha)	319846			6.30E+00 /	6.30E+00 /		0.011 c	0.00099 c	0.0005 c	0.45 c	0.1 c
HCH (beta)	319857			1.80E+00 /	1.80E+00 /		0.037 c	0.0035 c	0.0018 c	1.6 c	0.35 c
HCH (gamma) Lindane	58899	3.00E-04 /		1.30E+00 h			0.052 c	0.0048 c	0.0024 c	2.2 c	0.49 c
HCH-technical	608731			1.80E+00 /	1.79E+00 /		0.037 c	0.0035 c	0.0018 c	1.6 c	0.35 c
Heptachlor	76448	5.00E-04 /		4.50E+00 /	4.55E+00 /	***	0.0023 c	0.0014 c	0.0007 c	0.64 c	0.14 c
Heptachlor epoxide	1024573	1.30E-05 /		9.10E+00 /	9.10E+00 /	***	0.0012 c	0.00069 c	0.00035 c	0.31 c	0.07 c
Hexabromobenzene	87821	2.00E-03 /				***	12 n	7.3 n	2.7 n	2000 n	160 n
Hexachlorobenzene	118741	8.00E-04 /		1.60E+00 /	1.61E+00 /	***	0.0066 c	0.0039 c	0.002 c	1.8 c	0.4 c
Hexachlorobutadiene	87683	2.00E-04 h		7.80E-02 /	7.70E-02 /	***	0.14 c	0.081 c	0.04 c	37 c	8.2 c
Hexachlorocyclopentadiene	77474	7.00E-03 /	2.00E-05 h			***	0.15 n	0.073 n	9.5 n	7200 n	550 n
Hexachlorodibenzo-p-dioxin mixture	19408743			6.20E+03 /	4.55E+03 /		0.000011 c	1.40E-06 c	5.10E-07 c	0.00046 c	0.0001 c
Hexachloroethane	67721	1.00E-03 /		1.40E-02 /	1.40E-02 /	***	0.75 c	0.45 c	0.23 c	200 c	46 c
Hexachlorophene	70304	3.00E-04 /					11 n	1.1 n	0.41 n	310 n	23 n
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121824	3.00E-03 /		1.10E-01 /			0.61 c	0.057 c	0.029 c	26 c	5.8 c
1,6-Hexamethylene diisocyanate	822060		2.86E-06 /				0.1 a	0.01 a			
n-Hexane	110543	6.00E-02 h	5.71E-02 /			***	350 n	210 n	81 n	61000 n	4700 n
Hexazinone	51235042	3.30E-02 /					1200 n	120 n	45 n	34000 n	2600 n
Hydrazine, hydrazine sulfate	302012			3.00E+00 /	1.71E+01 /		0.022 c	0.00037 c	0.0011 c	0.95 c	0.21 c
Hydrogen chloride	7647010		2.00E-03 /				73 n	7.3 n			
Hydrogen sulfide	7783064	3.00E-03 /	2.57E-04 /				110 n	0.94 n	4.1 n	3100 n	230 n
Hydroquinone	123319	4.00E-02 h					1500 n	150 n	54 n	41000 n	3100 n
Imazalil	35554440	1.30E-02 /					470 n	47 n	18 n	13000 n	1000 n
Imazaquin	81335377	2.50E-01 /				***	9100 n	910 n	340 n	260000 n	20000 n
Iprodione	36734197	4.00E-02 /					1500 n	150 n	54 n	41000 n	3100 n
Isobutanol	78831	3.00E-01 /					1800 n	1100 n	410 n	310000 n	23000 n
Isophorone	78591	2.00E-01 /		9.50E-04 /			71 c	6.6 c	3.3 c	3000 c	670 c
Isopropalin	33820530	1.50E-02 /					550 n	55 n	20 n	15000 n	1200 n
Isopropyl methyl phosphonic acid	1832548	1.00E-01 /					3700 n	370 n	140 n	100000 n	7800 n
Isoxaben	82558507	5.00E-02 /		1.80E+01 •			1800 n	180 n	68 n	51000 n	3900 n
Kepon	143500						0.0037 c	0.00035 c	0.00018 c	0.16 c	0.035 c
Lactofen	77501634	2.00E-03 /					73 n	7.3 n	2.7 n	2000 n	160 n
Lead (tetraethyl)	78002	1.00E-07 /					0.0037 n	0.00037 n	0.00014 n	0.1 n	0.0078 n
Linuron	330552	2.00E-03 /					73 n	7.3 n	2.7 n	2000 n	160 n
Lithium	7439932	2.00E-02 •					730 n	73 n	27 n	20000 n	1600 n
Londax	83056996	2.00E-01 /					7300 n	730 n	270 n	200000 n	16000 n
Malathion	121755	2.00E-02 /					730 n	73 n	27 n	20000 n	1600 n
Maleic anhydride	108316	1.00E-01 /					3700 n	370 n	140 n	100000 n	7800 n

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Contaminant	CAS	RfDo		RfDi	CPSo		CPSi	V	Tap water		Ambient air	Fish	Industrial		Residential	
		mg/kg/d	mg/kg/d		kg/d/mg	kg/d/mg			µg/L	µg/m3			mg/kg	mg/kg	soil	soil
Maleic hydrazide	12331	5.00E-01 i							18000 n	1800 n	680 n	510000 n	39000 n			
Malononitrile	109773	2.00E-05 h							0.73 n	0.073 n	0.027 n	20 n	1.6 n			
Mancozeb	8018017	3.00E-02 h							1100 n	110 n	41 n	31000 n	2300 n			
Maneb	12427382	5.00E-03 i							180 n	18 n	6.8 n	5100 n	390 n			
Manganese and compounds	7439965	5.00E-03 i	1.43E-05 i						180 n	0.052 n	6.8 n	5100 n	390 n			
Mepfosfolan	950107	9.00E-05 h							3.3 n	0.33 n	0.12 n	92 n	7 n			
Mepiquat chloride	24307264	3.00E-02 i							1100 n	110 n	41 n	31000 n	2300 n			
Mercury (inorganic)	7439976	3.00E-04 h	8.57E-05 h						11 n	0.31 n	0.41 n	310 n	23 n			
Mercury (methyl)	22967926	3.00E-04 i							11 n	1.1 n	0.41 n	310 n	23 n			
Merphos	150505	3.00E-05 i							1.1 n	0.11 n	0.041 n	31 n	2.3 n			
Merphos oxide	78488	3.00E-05 i							1.1 n	0.11 n	0.041 n	31 n	2.3 n			
Metalaxyl	57837191	6.00E-02 i							2200 n	220 n	81 n	61000 n	4700 n			
Methacrylonitrile	126987	1.00E-04 i	2.00E-04 a						3.7 n	0.73 n	0.14 n	100 n	7.8 n			
Methamidophos	10265926	5.00E-05 i							1.8 n	0.18 n	0.068 n	51 n	3.9 n			
Methanol	67561	5.00E-01 i							18000 n	1800 n	680 n	510000 n	39000 n			
Methidathion	950378	1.00E-03 i							37 n	3.7 n	1.4 n	1000 n	78 n			
Methomyl	16752775	2.50E-02 i							910 n	91 n	34 n	26000 n	2000 n			
Methoxychlor	72435	5.00E-03 i							180 n	18 n	6.8 n	5100 n	390 n			
2-Methoxyethanol acetate	110496	2.00E-03 a							73 n	7.3 n	2.7 n	2000 n	160 n			
2-Methoxyethanol	109864	1.00E-03 h	5.71E-03 i						37 n	21 n	1.4 n	1000 n	78 n			
2-Methoxy-5-nitroaniline	99592		4.60E-02 h						1.5 c	0.14 c	0.069 c	62 c	14 c			
Methyl acetate	79209	1.00E+00 h							37000 n	3700 n	1400 n	1000000 n	78000 n			
Methyl acrylate	96333	3.00E-02 a							1100 n	110 n	41 n	31000 n	2300 n			
2-Methylaniline hydrochloride	636215		1.80E-01 h						0.37 c	0.035 c	0.018 c	16 c	3.5 c			
2-Methylaniline	95534		2.40E-01 h						0.28 c	0.026 c	0.013 c	12 c	2.7 c			
Methyl chlorocarbonate	79221	1.00E+00 w							37000 n	3700 n	1400 n	1000000 n	78000 n			
4-(2-Methyl-4-chlorophenoxy) butyric acid	94815	1.00E-02 i							370 n	37 n	14 n	10000 n	780 n			
2-Methyl-4-chlorophenoxyacetic acid	94746	5.00E-04 i							18 n	1.8 n	0.68 n	510 n	39 n			
2-(2-Methyl-14-chlorophenoxy)propionic acid	93652	1.00E-03 i							37 n	3.7 n	1.4 n	1000 n	78 n			
Methylcyclohexane	108872		8.57E-01 h						31000 n	3100 n						
Methylene bromide	74953	1.00E-02 a							61 n	37 n	14 n	10000 n	780 n			
Methylene chloride	75092	6.00E-02 i	8.57E-01 h		7.50E-03 i	1.64E-03 i			4.1 c	3.8 c	0.42 c	380 c	85 c			
4,4'-Methylene bis(2-chloroaniline)	101144	7.00E-04 h			1.30E-01 h	1.30E-01 h			0.52 c	0.048 c	0.024 c	22 c	4.9 c			
4,4'-Methylenebisbenzenamine	101779		2.50E-01 w						0.27 c	0.025 c	0.013 c	11 c	2.6 c			
4,4'-Methylene bis(N,N'-dimethyl)aniline	101611		4.60E-02 i						1.5 c	0.14 c	0.069 c	62 c	14 c			
4,4'-Methylenediphenyl isocyanate	101688		5.71E-06 i						0.035 n	0.021 n						
Methyl ethyl ketone	78933	6.00E-01 i	2.86E-01 i						1900 n	1000 n	810 n	610000 n	47000 n			
Methyl hydrazine	60344		1.10E+00 w						0.061 c	0.0057 c	0.0029 c	2.6 c	0.58 c			
Methyl isobutyl ketone	108101	8.00E-02 h	2.29E-02 a						2900 n	290 n	110 n	82000 n	6300 n			
Methyl methacrylate	80626	8.00E-02 h							2900 n	290 n	110 n	82000 n	6300 n			
2-Methyl-5-nitroaniline	99558		3.30E-02 h						2 c	0.19 c	0.096 c	87 c	19 c			
Methyl parathion	298000	2.50E-04 i							9.1 n	0.91 n	0.34 n	260 n	20 n			



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Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects.

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg d/mg	CPSi kg d/mg	V	O	C	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
2-Methylphenol (o-cresol)	95487	5.00E-02 /							1800 n	180 n	68 n	51000 n	3900 n
3-Methylphenol (m-cresol)	103394	5.00E-02 /							1800 n	180 n	68 n	51000 n	3900 n
4-Methylphenol (p-cresol)	106445	5.00E-03 h							180 n	18 n	6.8 n	5100 n	390 n
Methyl styrene (mixture)	25013154	6.00E-03 •	1.14E-02 •			•••			60 n	42 n	8.1 n	6100 n	470 n
Methyl styrene (alpha)	98839	7.00E-02 •				•••			430 n	260 n	95 n	72000 n	5500 n
Methyl tertbutyl ether (MTBE)	1634044	5.00E-03 •	8.57E-01 /			•••			180 n	3100 n	6.8 n	5100 n	390 n
Metolacfor (Dual)	51218452	1.50E-01 h							5500 n	550 n	200 n	150000 n	12000 n
Metribuzin	21807649	2.50E-02 /							910 n	91 n	34 n	26000 n	2000 n
Mirex	2385855	2.00E-04 /		1.80E+00 w					0.037 c	0.0035 c	0.0018 c	1.6 c	0.35 c
Molinate	2212671	2.00E-03 /							73 n	7.3 n	2.7 n	2000 n	160 n
Molybdenum	7439987	5.00E-03 /							180 n	18 n	6.8 n	5100 n	390 n
Monochloramine	10599903	1.00E-01 /							3700 n	370 n	140 n	100000 n	7800 n
Naled	300765	2.00E-03 /							73 n	7.3 n	2.7 n	2000 n	160 n
2-Naphthylamine	91598		1.30E+02 •						0.00052 c	0.000048 c	0.000024 c	0.022 c	0.0049 c
Napropamide	15299997	1.00E-01 /							3700 n	370 n	140 n	100000 n	7800 n
Nickel refinery dust										0.0075 c			
Nickel (soluble salts)	7440020	2.00E-02 /							730 n	73 n	27 n	20000 n	1600 n
Nickel subsulfide	12035722									0.0037 c			
Nitrapyrin	1929824	1.50E-03 w							55 n	5.5 n	2 n	1500 n	120 n
Nitrate	14797558	1.60E+00 /							58000 n	5800 n	2200 n	1000000 n	130000 n
Nitric Oxide	10102439	1.00E-01 w							3700 n	370 n	140 n	100000 n	7800 n
Nitrite	14797650	1.00E-01 /							3700 n	370 n	140 n	100000 n	7800 n
2-Nitroaniline	88744	6.00E-05 w	5.71E-05 h						2.2 n	0.21 n	0.081 n	61 n	4.7 n
3-Nitroaniline	99092	3.00E-03 o							110 n	11 n	4.1 n	3100 n	230 n
4-Nitroaniline	100016	3.00E-03 o				•••			110 n	11 n	4.1 n	3100 n	230 n
Nitrobenzene	98953	5.00E-04 /	5.71E-04 •						3.4 n	2.1 n	0.68 n	510 n	39 n
Nitrofurantoin	67209	7.00E-02 h							2600 n	260 n	95 n	72000 n	5500 n
Nitrofurazone	59870			1.50E+00 h	9.40E+00 h				0.045 c	0.00067 c	0.0021 c	1.9 c	0.43 c
Nitrogen dioxide	10102440	1.00E+00 w							37000 n	3700 n	1400 n	1000000 n	78000 n
Nitroguanidine	556887	1.00E-01 /							3700 n	370 n	140 n	100000 n	7800 n
4-Nitrophenol	100027	6.20E-02 o							2300 n	230 n	84 n	63000 n	4800 n
2-Nitropropane	79469		5.71E-03 /		9.40E+00 h				210 n	0.00067 c			
N-Nitrosodi-n-butylamine	924163			5.40E+00 /	5.60E+00 /				0.012 c	0.0011 c	0.00058 c	0.53 c	0.12 c
N-Nitrosodietanolamine	1116547			2.80E+00 /					0.024 c	0.0022 c	0.0011 c	1 c	0.23 c
N-Nitrosodietylamine	55185			1.50E+02 /	1.51E+02 /				0.00045 c	0.000041 c	0.000021 c	0.019 c	0.0043 c
N-Nitrosodimethylamine	62759			5.10E+01 /	4.90E+01 /				0.0013 c	0.00013 c	0.000062 c	0.056 c	0.013 c
N-Nitrosodiphenylamine	86306			4.90E-03 /					14 c	1.3 c	0.64 c	580 c	130 c
N-Nitroso di-n-propylamine	621647			7.00E+00 /					0.0096 c	0.00089 c	0.00045 c	0.41 c	0.091 c
N-Nitroso-N-methylethylamine	10595956			2.20E+01 /					0.0031 c	0.00028 c	0.00014 c	0.13 c	0.029 c
N-Nitrosopyrrolidine	930552			2.10E+00 /	2.13E+00 /				0.032 c	0.0029 c	0.0015 c	1.4 c	0.3 c
m-Nitrotoluene	99081	1.00E-02 h				•••			61 n	37 n	14 n	10000 n	780 n
o-Nitrotoluene	88722	1.00E-02 h				•••			61 n	37 n	14 n	10000 n	780 n

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg/d/mg	CPSi kg/d/mg	V	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
p-Nitrotoluene	99990	1.00E-02 h				***	61 n	37 n	14 n	10000 n	780 n
Norflurazon	27314132	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
NuStar	85509199	7.00E-04 i					26 n	2.6 n	0.95 n	720 n	55 n
Octabromodiphenyl ether	32536520	3.00E-03 i					110 n	11 n	4.1 n	3100 n	230 n
Octahydro-1357-tetranitro-1357-tetrazocine	2691410	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Octamethylpyrophosphoramide	152169	2.00E-03 h					73 n	7.3 n	2.7 n	2000 n	160 n
Oryzalin	19044883	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Oxadiazon	19666309	5.00E-03 i					180 n	18 n	6.8 n	5100 n	390 n
Oxamyl	23135220	2.50E-02 i					910 n	91 n	34 n	26000 n	2000 n
Oxyfluorfen	42874033	3.00E-03 i					110 n	11 n	4.1 n	3100 n	230 n
Paclobutrazol	76738620	1.30E-02 i					470 n	47 n	18 n	13000 n	1000 n
Paraquat	1910425	4.50E-03 i					160 n	16 n	6.1 n	4600 n	350 n
Parathion	56382	6.00E-03 h					220 n	22 n	8.1 n	6100 n	470 n
Pebulate	1114712	5.00E-02 h					1800 n	180 n	68 n	51000 n	3900 n
Pendimethalin	40487421	4.00E-02 i					1500 n	150 n	54 n	41000 n	3100 n
Pentabromo-6-chloro cyclohexane	87843		2.30E-02 h				2.9 c	0.27 c	0.14 c	120 c	28 c
Pentabromodiphenyl ether	32534819	2.00E-03 i				***	73 n	7.3 n	2.7 n	2000 n	160 n
Pentachlorobenzene	608935	8.00E-04 i					4.9 n	2.9 n	1.1 n	820 n	63 n
Pentachloronitrobenzene	82688	3.00E-03 i		2.60E-01 h		***	0.041 c	0.024 c	0.012 c	11 c	2.5 c
Pentachlorophenol	87865	3.00E-02 i		1.20E-01 i			0.56 c	0.052 c	0.026 c	24 c	5.3 c
Permethrin	52645531	5.00E-02 i					1800 n	180 n	68 n	51000 n	3900 n
Phenmedipham	13684634	2.50E-01 i					9100 n	910 n	340 n	260000 n	20000 n
m-Phenylenediamine	108952	6.00E-01 i					22000 n	2200 n	810 n	610000 n	47000 n
p-Phenylenediamine	108452	6.00E-03 i					220 n	22 n	8.1 n	6100 n	470 n
Phenylmercuric acetate	106503	1.90E-01 h					6900 n	690 n	260 n	190000 n	15000 n
2-Phenylphenol	62384	8.00E-05 i					2.9 n	0.29 n	0.11 n	82 n	6.3 n
Phorate	90437		1.94E-03 h				35 c	3.2 c	1.6 c	1500 c	330 c
Phosmet	298022	2.00E-04 h					7.3 n	0.73 n	0.27 n	200 n	16 n
Phosphine	732116	2.00E-02 i					730 n	73 n	27 n	20000 n	1600 n
Phosphorus (white)	7803512	3.00E-04 i	8.57E-06 h				11 n	0.031 n	0.41 n	310 n	23 n
p-Phthalic acid	7723140	2.00E-05 i					0.73 n	0.073 n	0.027 n	20 n	1.6 n
Phthalic anhydride	100210	1.00E+00 h					37000 n	3700 n	1400 n	100000 n	78000 n
Picloram	85449	2.00E+00 i	3.43E-01 h				73000 n	1300 n	2700 n	100000 n	160000 n
Pirimiphos-methyl	1918021	7.00E-02 i					2600 n	260 n	95 n	72000 n	5500 n
Polybrominated biphenyls	29232937	1.00E-02 i					370 n	37 n	14 n	10000 n	780 n
Polychlorinated biphenyls (PCBs)		7.00E-06 h		8.90E+00 h			0.0076 c	0.0007 c	0.00035 c	0.32 c	0.072 c
Aroclor 1016	1336363	7.00E-05 i		7.70E+00 i			0.0087 c	0.00081 c	0.00041 c	0.37 c	0.083 c
Aroclor 1254	12674112	2.00E-05 i					2.6 n	0.26 n	0.095 n	72 n	5.5 n
Polychlorinated terphenyls (PCTs)	11097691			4.50E+00 •			0.73 n	0.073 n	0.027 n	20 n	1.6 n
Polynuclear aromatic hydrocarbons							0.015 c	0.0014 c	0.0007 c	0.64 c	0.14 c
Acenaphthene	83329	6.00E-02 i					2200 n	220 n	81 n	61000 n	4700 n

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Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects

Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg·d/mg	CPSi kg·d/mg	Y O	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Anthracene	120127	3.00E-01 /					11000 n	1100 n	410 n	310000 n	23000 n
Benz[a]pyrene	50328			7.30E+00 /	6.10E+00 h		0.0092 c	0.001 c	0.00043 c	0.39 c	0.088 c
Benz[b]fluoranthene	205992			7.30E-01 •	6.10E-01 •		0.092 c	0.01 c	0.0043 c	3.9 c	0.88 c
Benz[k]fluoranthene	207089			7.30E-02 •	6.10E-02 •		0.92 c	0.1 c	0.043 c	39 c	8.8 c
Benz[a]anthracene	56553			7.30E-01 •	6.10E-01 •		0.092 c	0.01 c	0.0043 c	3.9 c	0.88 c
Chrysene	218019			7.30E-03 •	6.10E-03 •		9.2 c	1 c	0.43 c	390 c	88 c
Dibenz[ah]anthracene	53703			7.30E+00 •	6.10E+00 •		0.0092 c	0.001 c	0.00043 c	0.39 c	0.088 c
Fluoranthene	206440	4.00E-02 /					1500 n	150 n	54 n	41000 n	3100 n
Fluorene	86737	4.00E-02 /					1500 n	150 n	54 n	41000 n	3100 n
Indeno[1,2,3-cd]pyrene	193395			7.30E-01 •	6.10E-01 •		0.092 c	0.01 c	0.0043 c	3.9 c	0.88 c
Naphthalene	91203	4.00E-02 w					1500 n	150 n	54 n	41000 n	3100 n
Pyrene	129000	3.00E-02 /					1100 n	110 n	41 n	31000 n	2300 n
Prochloraz	67747095	9.00E-03 /		1.50E-01 /			0.45 c	0.042 c	0.021 c	19 c	4.3 c
Profluralin	26399360	6.00E-03 h					220 n	22 n	8.1 n	6100 n	470 n
Prometon	1610180	1.50E-02 /					550 n	55 n	20 n	15000 n	1200 n
Prometryn	7287196	4.00E-03 /					150 n	15 n	5.4 n	4100 n	310 n
Pronamide	23950385	7.50E-02 /					2700 n	270 n	100 n	77000 n	5900 n
Propachlor	1918167	1.30E-02 /					470 n	47 n	18 n	13000 n	1000 n
Propanil	709988	5.00E-03 /					180 n	18 n	6.8 n	5100 n	390 n
Propargite	2312358	2.00E-02 /					730 n	73 n	27 n	20000 n	1600 n
Propargyl alcohol	107197	2.00E-03 /					73 n	7.3 n	2.7 n	2000 n	160 n
Propazine	139402	2.00E-02 /					730 n	73 n	27 n	20000 n	1600 n
Propham	122429	2.00E-02 /					730 n	73 n	27 n	20000 n	1600 n
Propiconazole	60207901	1.30E-02 /					470 n	47 n	18 n	13000 n	1000 n
Propylene glycol	57556	2.00E+01 h					730000 n	73000 n	27000 n	1000000 n	1000000 n
Propylene glycol, monoethyl ether	52125538	7.00E-01 h					26000 n	2600 n	950 n	720000 n	55000 n
Propylene glycol, monomethyl ether	107982	7.00E-01 h	5.71E-01 /				26000 n	2100 n	950 n	720000 n	55000 n
Propylene oxide	75569		8.57E-03 /	2.40E-01 /	1.29E-02 /		0.28 c	0.49 c	0.013 c	12 c	2.7 c
Pursuit	81335775	2.50E-01 /					9100 n	910 n	340 n	260000 n	20000 n
Pydrin	51630581	2.50E-02 /					910 n	91 n	34 n	26000 n	2000 n
Pyridine	110861	1.00E-03 /					37 n	3.7 n	1.4 n	1000 n	78 n
Quinalphos	13593038	5.00E-04 /					18 n	1.8 n	0.68 n	510 n	39 n
Quinoline	91225			1.20E+01 h			0.0056 c	0.00052 c	0.00026 c	0.24 c	0.053 c
Resmethrin	10463868	3.00E-02 /					1100 n	110 n	41 n	31000 n	2300 n
Ronnel	299843	5.00E-02 h					1800 n	180 n	68 n	51000 n	3900 n
Rotenone	83794	4.00E-03 /					150 n	15 n	5.4 n	4100 n	310 n
Savay	78587050	2.50E-02 /					910 n	91 n	34 n	26000 n	2000 n
Selenious Acid	7783008	5.00E-03 /					180 n	18 n	6.8 n	5100 n	390 n
Selenium	7782492	5.00E-03 /					180 n	18 n	6.8 n	5100 n	390 n
Selenourea	630104	5.00E-03 h					180 n	18 n	6.8 n	5100 n	390 n
Sethoxydim	74051802	9.00E-02 /					3300 n	330 n	120 n	92000 n	7000 n
Silver and compounds	7440224	5.00E-03 /					180 n	18 n	6.8 n	5100 n	390 n

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Contaminant	CAS	RfDo mg/kg/d	RfDi mg/kg/d	CPSo kg/d/mg	CPSi kg/d/mg	V O C	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Simazine	122349	5.00E-03 /		1.20E-01 h			0.56 c	0.052 c	0.026 c	24 c	5.3 c
Sodium azide	26628228	4.00E-03 /					150 n	15 n	5.4 n	4100 n	310 n
Sodium diethyldithiocarbamate	148185	3.00E-02 /		2.70E-01 h			0.25 c	0.023 c	0.012 c	11 c	2.4 c
Sodium fluoroacetate	62748	2.00E-05 /					0.73 n	0.073 n	0.027 n	20 n	1.6 n
Sodium metavanadate	13718268	1.00E-03 h					37 n	3.7 n	1.4 n	1000 n	78 n
Strontium, stable	7440246	6.00E-01 /					22000 n	2200 n	810 n	610000 n	47000 n
Strychnine	57249	3.00E-04 /				***	11 n	1.1 n	0.41 n	310 n	23 n
Styrene	100425	2.00E-01 /	2.86E-01 /				1600 n	1000 n	270 n	200000 n	16000 n
Systhane	88671890	2.50E-02 /					910 n	91 n	34 n	26000 n	2000 n
2,3,7,8-TCDD (dioxin)	1746016			1.56E-05 h	1.16E-05 h		4.30E-07 c	5.40E-08 c	2.00E-08 c	0.000018 c	4.10E-06 c
Tebuthiuron	34014181	7.00E-02 /					2600 n	260 n	95 n	72000 n	5500 n
Temephos	3383968	2.00E-02 h					730 n	73 n	27 n	20000 n	1600 n
Terbacil	5902512	1.30E-02 /					470 n	47 n	18 n	13000 n	1000 n
Terbufos	13071799	2.50E-05 h					0.91 n	0.091 n	0.034 n	26 n	2 n
Terbutryn	886500	1.00E-03 /					37 n	3.7 n	1.4 n	1000 n	78 n
1,2,4,5-Tetrachlorobenzene	95943	3.00E-04 /				***	1.8 n	1.1 n	0.41 n	310 n	23 n
1,1,1,2-Tetrachloroethane	630206	3.00E-02 /		2.60E-02 /	2.59E-02 /	***	0.41 c	0.24 c	0.12 c	110 c	25 c
1,1,2,2-Tetrachloroethane	79345			2.00E-01 /	2.03E-01 /	***	0.052 c	0.031 c	0.016 c	14 c	3.2 c
Tetrachloroethylene (PCE)	127184	1.00E-02 /		5.20E-02 •	2.03E-03 •	***	1.1 c	3.1 c	0.061 c	55 c	12 c
2,3,4,6-Tetrachlorophenol	58902	3.00E-02 /				***	1100 n	110 n	41 n	31000 n	2300 n
p,a,a-Tetrachlorotoluene	5216251			2.00E-01 h		***	0.00053 c	0.00031 c	0.00016 c	0.14 c	0.032 c
Tetrachlorovinphos	961115	3.00E-02 /		2.40E-02 h			2.8 c	0.26 c	0.13 c	120 c	27 c
Tetraethylthiopyrophosphate	3689245	5.00E-04 /					18 n	1.8 n	0.68 n	510 n	39 n
Thallic oxide	1314325	7.00E-05 w					2.6 n	0.26 n	0.095 n	72 n	5.5 n
Thallium											
Thallium acetate	563688	9.00E-05 /					3.3 n	0.33 n	0.12 n	92 n	7 n
Thallium carbonate	6533739	8.00E-05 /					2.9 n	0.29 n	0.11 n	82 n	6.3 n
Thallium chloride	7791120	8.00E-05 /					2.9 n	0.29 n	0.11 n	82 n	6.3 n
Thallium nitrate	10102451	9.00E-05 /					3.3 n	0.33 n	0.12 n	92 n	7 n
Thallium selenite	12039520	9.00E-05 w					3.3 n	0.33 n	0.12 n	92 n	7 n
Thallium sulfate	7446186	8.00E-05 /					2.9 n	0.29 n	0.11 n	82 n	6.3 n
Thiobencarb	28249776	1.00E-02 /					370 n	37 n	14 n	10000 n	780 n
2-(Thiocyanomethylthio)-benzothiazole	21564170	3.00E-02 h					1100 n	110 n	41 n	31000 n	2300 n
Thiofanox	39196184	3.00E-04 h					11 n	1.1 n	0.41 n	310 n	23 n
Thiophanate-methyl	23564058	8.00E-02 /					2900 n	290 n	110 n	82000 n	6300 n
Thiram	137262	5.00E-03 /					180 n	18 n	6.8 n	5100 n	390 n
Tin and compounds						***					
Toluene	108883	2.00E-01 h	1.14E-01 w				22000 n	2200 n	810 n	610000 n	47000 n
Toluene-2,4-diamine	95807			3.20E-00 h			750 n	420 n	270 n	200000 n	16000 n
Toluene-2,5-diamine	95705	6.00E-01 h					0.021 c	0.002 c	0.00059 c	0.89 c	0.2 c
Toluene-2,6-diamine	823405	2.00E-01 h					22000 n	2200 n	810 n	610000 n	47000 n
p-Toluidine	106490			1.90E-01 h			7300 n	730 n	270 n	200000 n	16000 n
							0.35 c	0.033 c	0.017 c	15 c	3.4 c

Sources: l=IRIS h=HEAST a=HEAST alt. w=Withdrawn from IRIS or HEAST e=EPA-ECAO provisional o=Other EPA documents

Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects

Contaminant	CAS	RfDo mg/kg/d	RfDI mg/kg/d	CPSo kg/d/mg	CPSi kg/d/mg	V O	Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
Toxaphene	8001352			1.10E+00 /	1.12E+00 /		0.061 c	0.0056 c	0.0029 c	2.6 c	0.58 c
Tralomeethrin	66841256	7.50E-03 /					270 n	27 n	10 n	7700 n	590 n
Triallate	2303175	1.30E-02 /					470 n	47 n	18 n	13000 n	1000 n
Triasulfuron	82097505	1.00E-02 /					370 n	37 n	14 n	10000 n	780 n
1,2,4-Tribromobenzene	615543	5.00E-03 /				***	30 n	18 n	6.8 n	5100 n	390 n
Tributyltin oxide (TBTO)	56359	3.00E-05 /					1.1 n	0.11 n	0.041 n	31 n	2.3 n
2,4,6-Trichloroaniline hydrochloride	33663502			2.90E-02 h			2.3 c	0.22 c	0.11 c	99 c	22 c
2,4,6-Trichloroaniline	634935			3.40E-02 h			2 c	0.18 c	0.093 c	84 c	19 c
1,2,4-Trichlorobenzene	120821	1.00E-02 /	5.71E-02 h			***	190 n	210 n	14 n	10000 n	780 n
1,1,1-Trichloroethane	71556	9.00E-02 w	2.86E-01 w			***	1300 n	1000 n	120 n	92000 n	7000 n
1,1,2-Trichloroethane	79005	4.00E-03 /		5.70E-02 /	5.60E-02 /	***	0.19 c	0.11 c	0.055 c	50 c	11 c
Trichloroethylene (TCE)	79016	6.00E-03 •		1.10E-02 w	6.00E-03 •	***	1.6 c	1 c	0.29 c	260 c	58 c
Trichlorofluoromethane	75694	3.00E-01 /	2.00E-01 •			***	1300 n	730 n	410 n	310000 n	23000 n
2,4,5-Trichlorophenol	95954	1.00E-01 /					3700 n	370 n	140 n	100000 n	7800 n
2,4,6-Trichlorophenol	88062			1.10E-02 /	1.09E-02 /		6.1 c	0.57 c	0.29 c	260 c	58 c
2,4,5-Trichlorophenoxyacetic acid	93765	1.00E-02 /					370 n	37 n	14 n	10000 n	780 n
2-(2,4,5-Trichlorophenoxy)propionic acid	93721	8.00E-03 /					290 n	29 n	11 n	8200 n	630 n
1,1,2-Trichloropropane	598776	5.00E-03 /				***	30 n	18 n	6.8 n	5100 n	390 n
1,2,3-Trichloropropane	96184	6.00E-03 /		7.00E+00 /		***	0.0015 c	0.00089 c	0.00045 c	0.41 c	0.091 c
1,2,3-Trichloropropene	96195	5.00E-03 h				***	30 n	18 n	6.8 n	5100 n	390 n
1,1,2-Trichloro-1,2,2-trifluoroethane	76131	3.00E+01 /	8.57E+00 h			***	59000 n	31000 n	41000 n	1000000 n	1000000 n
Tridipane	58138082	3.00E-03 /					110 n	11 n	4.1 n	3100 n	230 n
Triethylamine	121448		2.00E-03 /				73 n	7.3 n			
Trifluralin	1582098	7.50E-03 /		7.70E-03 /			8.7 c	0.81 c	0.41 c	370 c	83 c
1,2,4-Trimethylbenzene	95636	5.00E-04 •				***	3 n	1.8 n	0.68 n	510 n	39 n
1,3,5-Trimethylbenzene	108678	4.00E-04 •				***	2.4 n	1.5 n	0.54 n	410 n	31 n
Trimethyl phosphate	512561			3.70E-02 h			1.8 c	0.17 c	0.085 c	77 c	17 c
1,3,5-Trinitrobenzene	99354	5.00E-05 /					1.8 n	0.18 n	0.068 n	51 n	3.9 n
Trinitrophenylmethylnitramine	479458	1.00E-02 h					370 n	37 n	14 n	10000 n	780 n
2,4,6-Trinitrotoluene	118967	5.00E-04 /		3.00E-02 /			2.2 c	0.21 c	0.11 c	95 c	21 c
Uranium (soluble salts)	7440611	3.00E-03 /					110 n	11 n	4.1 n	3100 n	230 n
Vanadium	7440622	7.00E-03 h					260 n	26 n	9.5 n	7200 n	550 n
Vanadium pentoxide	1314621	9.00E-03 /					330 n	33 n	12 n	9200 n	700 n
Vanadium sulfate	36907423	2.00E-02 h					730 n	73 n	27 n	20000 n	1600 n
Vernam	1929777	1.00E-03 /					37 n	3.7 n	1.4 n	1000 n	78 n
Vinclozolin	50471448	2.50E-02 /					910 n	91 n	34 n	26000 n	2000 n
Vinyl acetate	108054	1.00E+00 h	5.71E-02 /				37000 n	210 n	1400 n	1000000 n	78000 n
Vinyl bromide	593602		8.57E-04 /			***	5.2 n	3.1 n			
Vinyl chloride	75014			1.90E+00 h	3.00E-01 h	***	0.019 c	0.021 c	0.0017 c	1.5 c	0.34 c
Warfarin	81812	3.00E-04 /					11 n	1.1 n	0.41 n	310 n	23 n
m-Xylene	108323	2.00E+00 h	2.00E-01 w			***	1400 n	730 n	2700 n	1000000 n	160000 n
o-Xylene	95476	2.00E+00 h	2.00E-01 w			***	1400 n	730 n	2700 n	1000000 n	160000 n

Sources: I=IRIS h=HEAST a=HEAST alt. w=Withdrawn from IRIS or HEAST e=EPA-ECAO provisional o=Other EPA documents Basis of RBC: c=carcinogenic effects n=noncarcinogenic effects

Contaminant	CAS	RfDo mg/kg/d	RfD <sub>1</sub> mg/kg/d	CPSo kg/d/mg	CPSi kg/d/mg	V		Tap water µg/L	Ambient air µg/m <sup>3</sup>	Fish mg/kg	Industrial soil mg/kg	Residential soil mg/kg
						O	C					
P-Xylene	1.06E+05		8.57E-02 w			***		5.20E+02 n	3.10E+02 n			
Xylene (mixed)	1.33E+06	2.00E+00 I				***		12000 n	7300 n	2700 n	1000000 n	160000 n
Zinc	7.44E+06	3.00E-01 I						11000 n	1100 n	410 n	310000 n	23000 n
Zinc phosphide	1.31E+06	3.00E-04 I						11 n	1.1 n	0.41 n	310 n	23 n
Zineb	1.21E+07	5.00E-02 I						1800 n	180 n	68 n	51000 n	3900 n

## **Screening Criteria**

## Screening Criteria - Waters

Analyte	Screening Criteria mg/L	Source
Acenaphthene	2.2	RN
Acenaphthylene	NA	NA
Acetone	3.7	RN
Aldrin	0.000040	RC
Alkalinity	NA	NA
Aluminum	NA	NA
Anthracene	11	RN
Antimony	0.0060	M
Arsenic	0.050	M
alpha-BHC	0.000011	RC
beta-BHC	0.000037	RC
delta-BHC	NA	NA
gamma-BHC	0.00020	M
Barium	2.0	M
Benz(a)anthracene	0.00010	M
Benzene	0.0050	M
Benzo(a)pyrene	0.00020	M
Benzo(b)fluoranthene	0.00020	M
Benzo(g,h,i)perylene	NA	NA
Benzo(k)fluoranthene	0.00020	M
Benzoic acid	150	RN
Benzyl alcohol	11	RN
Beryllium	0.0040	M
Bromobenzene	NA	NA
Bromodichloromethane	0.00017	RC
Bromoform	0.0024	RC
Bromomethane	0.0087	RN
4-Bromophenyl phenyl ether	2.1	RN
2-Butanone (MEK)	22	RN
Butylbenzylphthalate	0.10	M
Cadmium	0.0050	M
Calcium	NA	NA
Carbon disulfide	0.021	RN



### Screening Criteria - Waters (Continued)

Analyte	Screening Criteria mg/L	Source
Carbon tetrachloride	0.0050	M
Chlordane	0.0020	M
Chloride	NA	NA
4-Chloro-3-methylphenol	NA	NA
4-Chloroaniline	0.15	RN
Chlorobenzene	0.039	RN
Chloroethane	8.6	RN
bis(2-Chloroethoxy)methane	NA	NA
2-Chloroethyl vinyl ether	0.15	RN
bis(2-Chloroethyl)ether	0.0000092	RC
Chloroform	0.00015	RC
1-Chlorohexane	NA	NA
bis(2-Chloroisopropyl)ether	0.00026	RC
Chloromethane	0.0014	RC
2-Chloronaphthalene	2.9	RN
2-Chlorophenol	0.18	RN
4-Chlorophenyl phenyl ether	NA	NA
Chromium	0.10	M
Chrysene	0.00020	M
Cobalt	2.2	RN
Copper	1.3	M
4,4'-DDD	0.00028	RC
4,4'-DDE	0.00020	RC
4,4'-DDT	0.00020	RC
Di-n-octylphthalate	0.73	RN
Dibenz(a,h)anthracene	0.00030	M
Dibenzofuran	NA	NA
Dibromochloromethane	0.00013	RC
Dibromomethane	NA	NA
Dibutyl phthalate	3.7	RN
trans-1,4-Dichloro-2-butene	0.0000011	RC
1,2-Dichlorobenzene	0.60	M
1,3-Dichlorobenzene	0.60	M
1,4-Dichlorobenzene	0.075	M

### Screening Criteria - Waters (Continued)

Analyte	Screening Criteria mg/L	Source
3,3'-Dichlorobenzidine	0.00015	RC
Dichlorodifluoromethane	0.39	RN
1,1-Dichloroethane	0.81	RN
1,2-Dichloroethane	0.0050	M
1,1-Dichloroethene	0.0070	M
cis-1,2-Dichloroethene	0.070	M
trans-1,2-Dichloroethene	0.10	M
2,4-Dichlorophenol	0.11	RN
1,2-Dichloropropane	0.0050	M
cis-1,3-Dichloropropene	0.000077	RC
trans-1,3-Dichloropropene	0.000077	RC
Dieldrin	0.0000042	RC
Diesel Range Organics	0.052	RN
Diethylphthalate	29	RN
2,4-Dimethylphenol	0.73	RN
Dimethylphthalate	370	RN
4,6-Dinitro-2-methylphenol	NA	NA
2,4-Dinitrophenol	0.073	RN
2,4-Dinitrotoluene	0.073	RN
2,6-Dinitrotoluene	0.037	RN
Diphenylamine/N-NitrosoDPA	0.91	RN
Endosulfan I	0.22	RN
Endosulfan II	0.22	RN
Endosulfan sulfate	0.22	RN
Endrin	0.0020	M
Endrin aldehyde	0.011	RN
Ethanol	NA	NA
Ethyl ether	1.2	RN
Ethyl methacrylate	3.3	RN
Ethylbenzene	0.70	M
bis(2-Ethylhexyl)phthalate	0.0060	M
Fluoranthene	1.5	RN
Fluorene	1.5	RN
2-Fluorobiphenyl	NA	NA

### Screening Criteria - Waters (Continued)

Analyte	Screening Criteria mg/L	Source
2-Fluorophenol	NA	NA
Gasoline Range Organics	0.026	RN
Heptachlor	0.00040	M
Heptachlor epoxide	0.00020	M
Hexachlorobenzene	0.0010	M
Hexachlorobutadiene	0.00014	RC
Hexachlorocyclopentadiene	0.050	M
Hexachloroethane	0.00075	RC
2-Hexanone	NA	NA
Indeno(1,2,3-cd)pyrene	0.00040	M
Iodomethane	NA	NA
Iron	NA	NA
Isophorone	0.071	RC
Lead	0.015	M
Magnesium	NA	NA
Manganese	0.18	RN
Mercury	0.0020	M
Methoxychlor	0.040	M
4-Methyl-2-Pentanone(MIBK)	2.9	RN
Methylene chloride	0.0050	M
2-Methylnaphthalene	NA	NA
3-Methylphenol(m-cresol)	1.8	RN
2-Methylphenol(o-cresol)	1.8	RN
4-Methylphenol(p-cresol)	0.18	RN
Molybdenum	0.18	RN
N-Nitrosodiphenylamine	0.014	RC
N-Nitrosodipropylamine	0.0000096	RC
Naphthalene	1.5	RN
Nickel	0.10	M
Nitrate-Nitrite as N	1.0	M
2-Nitroaniline	0.0022	RN
3-Nitroaniline	0.11	RN
4-Nitroaniline	0.11	RN
Nitrobenzene	0.0034	RN

### Screening Criteria - Waters (Continued)

Analyte	Screening Criteria mg/L	Source
2-Nitrophenol	NA	NA
4-Nitrophenol	2.3	RN
OCDD	0.000030	M
OCDF	0.000030	M
PCB-1016	0.00050	M
PCB-1221	0.00050	M
PCB-1232	0.00050	M
PCB-1242	0.00050	M
PCB-1248	0.00050	M
PCB-1248	0.00050	M
PCB-1254	0.00050	M
PCB-1260	0.00050	M
PCBs	0.00050	M
PeCDD Totals	0.00000006	M
PeCDF Totals	0.00000006	M
Pentachlorophenol	0.0010	M
Phenanthrene	NA	NA
Phenol	22	RN
Potassium	NA	NA
Pyrene	1.1	RN
Selenium	0.050	M
Silver	0.18	RN
Sodium	NA	NA
Styrene	0.10	M
Sulfate	NA	NA
2,3,7,8-TCDD	0.000000030	M
TCDD Totals	0.000000030	M
TCDF Totals	0.000000030	M
1,1,1,2-Tetrachloroethane	0.00041	RC
1,1,2,2-Tetrachloroethane	0.000052	RC
Tetrachloroethene	0.0050	M
Thallium	0.0020	M
Toluene	1.0	M
Toxaphene	0.003	M

### Screening Criteria - Waters (Continued)

Analyte	Screening Criteria mg/L	Source
2,4,6-Tribromophenol	NA	NA
1,2,4-Trichlorobenzene	0.070	M
1,1,1-Trichloroethane	0.20	M
1,1,2-Trichloroethane	0.0050	M
Trichloroethene	0.0050	M
Trichlorofluoromethane	1.3	RN
2,4,5-Trichlorophenol	NA	NA
2,4,6-Trichlorophenol	0.0061	RC
1,2,3-Trichloropropane	0.0000015	RC
Vanadium	0.26	RN
Vinyl Chloride	0.0020	M
Vinyl acetate	37	RN
m-Xylene	1.4	RN
o-Xylene	1.4	RN
p-Xylene	0.52	RN
Xylene (total)	10	M
Zinc	11	RN

### Screening Criteria Source Codes

Screening Criteria Source	Code
State of Alaska Cleanup Levels	AK
Maximum Contaminant Level (MCL)	M
EPA Region III Risk-Based Concentrations, carcinogenic level	RC
EPA Region III Risk-Based Concentrations, noncarcinogenic level	RN

## Screening Criteria - Soils

Analyte	Residential Screening Criteria mg/kg	Industrial Screening Criteria mg/kg	Source
Acenaphthene	4700	61000	RN
Acenaphthylene	NA	NA	NA
Acetone	7800	100000	RN
Aldrin	0.038	0.17	RC
Aluminum	NA	NA	NA
Anthracene	23000	310000	RN
Antimony	31	410	RN
Arsenic	23	310	RN
alpha-BHC	0.10	0.45	RC
beta-BHC	0.35	1.6	RC
delta-BHC	NA	NA	NA
gamma-BHC	0.49	2.2	RC
BTEX (total)	15	15	AK
Barium	5500	72000	RN
Benz(a)anthracene	0.88	3.9	RC
Benzene	0.50	0.50	AK
Benzo(a)pyrene	0.088	0.39	RC
Benzo(b)fluoranthene	0.88	3.9	RC
Benzo(g,h,i)perylene	NA	NA	NA
Benzo(k)fluoranthene	8.8	39	RC
Benzoic acid	310000	1000000	RN
Benzyl alcohol	23000	310000	RN
Beryllium	0.15	0.67	RC
Bromobenzene	NA	NA	NA
Bromodichloromethane	10	46	RC
Bromoform	81	360	RC
Bromomethane	110	1400	RN
4-Bromophenyl phenyl ether	4500	590000	RN
2-Butanone(MEK)	47000	610000	RN
Butylbenzylphthalate	16000	200000	RN
Cadmium	39	510	RN
Calcium	NA	NA	NA

### Screening Criteria - Soils (Continued)

Analyte	Residential Screening Criteria mg/kg	Industrial Screening Criteria mg/kg	Source
Carbon disulfide	7800	100000	RN
Carbon tetrachloride	4.9	22	RC
Chlordane	0.49	2.2	RC
4-Chloro-3-methylphenol	NA	NA	NA
4-Chloroaniline	310	4100	RN
Chlorobenzene	1600	20000	RN
Chloroethane	31000	410000	RN
bis(2-Chloroethoxy)methane	NA	NA	NA
2-Chloroethyl vinyl ether	2000	26000	RN
bis(2-Chloroethyl)ether	0.58	2.6	RN
Chloroform	100	470	RC
1-Chlorohexane	NA	NA	NA
bis(2-Chloroisopropyl)ether	9.1	41	RC
Chloromethane	49	220	RC
2-Chloronaphthalene	6300	82000	RN
2-Chlorophenol	390	5100	RN
4-Chlorophenyl phenyl ether	NA	NA	NA
Chromium	390	1000000	RN
Chrysene	88	390	RC
Cobalt	4700	61000	RN
Copper	2900	38000	RN
4,4'-DDD	2.7	12	RC
4,4'-DDE	1.9	8.4	RC
4,4'-DDT	1.9	8.4	RC
Di-n-octylphthalate	1600	20000	RN
Dibenz(a,h)anthracene	0.088	0.39	RC
Dibenzofuran	NA	NA	NA
Dibromochloromethane	7.6	34	RC
Dibromomethane	NA	NA	NA
Dibutyl phthalate	7800	100000	RN
1,2-Dichlorobenzene	7000	92000	RN
1,3-Dichlorobenzene	7000	91000	RN
1,4-Dichlorobenzene	27	120	RC

### Screening Criteria - Soils (Continued)

Analyte	Residential Screening Criteria mg/kg	Industrial Screening Criteria mg/kg	Source
3,3'-Dichlorobenzidine	1.4	6.4	RC
1,1-Dichloroethane	7800	100000	RN
1,2-Dichloroethane	7.0	31	RC
1,1-Dichloroethene	1.1	4.8	RC
cis-1,2-Dichloroethene	780	10000	RN
trans-1,2-Dichloroethene	1600	20000	RN
2,4-Dichlorophenol	230	3100	RN
1,2-Dichloropropane	9.4	42	RC
cis-1,3-Dichloropropene	3.7	16	RC
trans-1,3-Dichloropropene	3.7	16	RC
Dieldrin	0.040	0.18	RC
Diesel Range Organics	200	200	AK
Diethylphthalate	63000	820000	RN
2,4-Dimethylphenol	1600	20000	RN
Dimethylphthalate	780000	1000000	RN
4,6-Dinitro-2-methylphenol	NA	NA	NA
2,4-Dinitrophenol	160	2000	RN
2,4-Dinitrotoluene	160	2000	RN
2,6-Dinitrotoluene	78	1000	RN
Diphenylamine/N-NitrosoDPA	2000	26000	RN
Endosulfan I	470	6100	RN
Endosulfan II	470	6100	RN
Endosulfan sulfate	470	6100	RN
Endrin	23	310	RN
Endrin aldehyde	23	310	RN
Ethylbenzene	7800	100000	RN
bis(2-Ethylhexyl)phthalate	46	200	RC
Fluoranthene	3100	41000	RN
Fluorene	3100	41000	RN
Gasoline Range Organics	100	100	AK
Heptachlor	0.14	0.64	RC
Heptachlor epoxide	0.070	0.31	RC
Hexachlorobenzene	0.40	1.8	RC



### Screening Criteria - Soils (Continued)

Analyte	Residential Screening Criteria mg/kg	Industrial Screening Criteria mg/kg	Source
Hexachlorobutadiene	8.2	37	RC
Hexachlorocyclopentadiene	550	7200	RN
Hexachloroethane	46	200	RC
2-Hexanone	NA	NA	NA
HpCDD Totals	0.00041	0.0018	RC
HpCDF Totals	0.00041	0.0018	RC
HpCDF Totals	0.00041	0.0018	RC
HxCDD Totals	0.000041	0.00018	RC
HxCDF Totals	0.000041	0.00018	RC
Indeno(1,2,3-cd)pyrene	0.88	3.9	RC
Iron	NA	NA	NA
Isophorone	670	3000	RC
Lead	400	400	EL
Magnesium	NA	NA	NA
Manganese	390	5100	RN
Mercury	23	310	RN
Methoxychlor	390	5100	RN
4-Methyl-2-Pentanone(MIBK)	6300	82000	RN
Methylene chloride	85	380	RC
2-Methylnaphthalene	NA	NA	NA
3-Methylphenol	3900	51000	RN
2-Methylphenol(o-cresol)	3900	51000	RN
4-Methylphenol(p-cresol)	390	5100	RN
Molybdenum	390	5100	RN
N-Nitrosodiphenylamine	130	580	RC
N-Nitrosodipropylamine	0.091	0.41	RC
Naphthalene	3100	41000	RN
Nickel	1600	20000	RN
2-Nitroaniline	4.7	61	RN
3-Nitroaniline	230	3100	RN
4-Nitroaniline	230	3100	RN
Nitrobenzene	39	510	RN
2-Nitrophenol	NA	NA	NA

### Screening Criteria - Soils (Continued)

Analyte	Residential Screening Criteria mg/kg	Industrial Screening Criteria mg/kg	Source
4-Nitrophenol	4800	63000	RN
OCDD	0.0041	0.018	RC
OCDF	0.0041	0.018	RC
PCB-1016	5.5	72	RN
PCB-1221	0.083	0.37	RC
PCB-1232	0.083	0.37	RC
PCB-1242	0.083	0.37	RC
PCB-1248	0.083	0.37	RC
PCB-1248	0.083	0.37	RC
PCB-1254	0.083	0.37	RC
PCB-1260	0.083	0.37	RC
PeCDD Totals	0.0000082	0.000036	RC
PeCDF Totals	0.0000082	0.000036	RC
Pentachlorophenol	5.3	24	RC
Phenanthrene	NA	NA	NA
Phenol	47000	610000	RN
Potassium	NA	NA	NA
Pyrene	2300	31000	RN
Selenium	390	5100	RN
Silver	390	5100	RN
Sodium	NA	NA	NA
Styrene	16000	200000	RN
2,3,7,8-TCDD	0.0000041	0.000018	RC
TCDD Totals	0.0000041	0.000018	RC
TCDF Totals	0.000041	0.00018	RC
1,1,1,2-Tetrachloroethane	25	110	RC
1,1,2,2-Tetrachloroethane	3.2	14	RC
Tetrachloroethene	12	55	RC
Thallium	6.3	82	RN
Toluene	16000	200000	RN
Toxaphene	0.58	2.6	RC
1,2,4-Trichlorobenzene	780	10000	RN
1,1,1-Trichloroethane	7000	92000	RN

### Screening Criteria - Soils (Continued)

Analyte	Residential Screening Criteria mg/kg	Industrial Screening Criteria mg/kg	Source
1,1,2-Trichloroethane	11	50	RC
Trichloroethene	58	260	RC
Trichlorofluoromethane	23000	310000	RN
2,4,5-Trichlorophenol	7800	100000	RN
2,4,6-Trichlorophenol	58	260	RC
1,2,3-Trichloropropane	0.091	0.41	RC
Vanadium	550	7200	RN
Vinyl Chloride	0.34	1.5	RC
Vinyl acetate	78000	1000000	RN
m-Xylene	160000	1000000	RN
o-Xylene	160000	1000000	RN
Xylene (total)	160000	1000000	RN
Zinc	23000	310000	RN

### Screening Criteria Source Codes

Screening Criteria Source	Code
State of Alaska Cleanup Levels	AK
EPA Lead Based-Risk Criteria	EL
EPA Region III Risk-Based Concentrations, carcinogenic level	RC
EPA Region III Risk-Based Concentrations, noncarcinogenic level	RN

**APPENDIX D**  
**Statistical Discussion**

## INTRODUCTION

The analysis for the Remedial Investigation (RI) included a statistical comparison of chemical data from the sites at Galena Airport and Campion AFS to data from unaffected areas (background). Individual concentrations from the affected areas were compared to an upper limit calculated from background concentrations. This upper limit is called an upper tolerance limit (UTL). Section 1 of this appendix presents an explanation of UTLs and their use in this RI. Section 2 discusses the calculation of UTLs.

### 1.0 Description of Upper Tolerance Limits for Background

Two types of statistical comparisons may be used to compare results from different sample populations. One approach involves means comparisons which are used to compare the *average* measured background concentration to a corresponding *average* measured concentration for an affected area. This type of test is referred to as a test of central tendency. An alternate approach involves comparing *individual* results from each affected area to calculated upper limits for background concentrations. This second type of comparison is referred to as an extreme value test. Extreme value tests were used to identify potentially contaminated areas for the RI.

Extreme value tests require estimating the upper extreme of a given population (in this case background concentrations). When the distribution of background data appear to follow a known distribution (for example, normal or lognormal), the known characteristics of the distribution can be used to estimate the concentration below which a given proportion of the data are expected to fall (this proportion is described as the *coverage*). Based on these characteristics, parametric UTLs can be calculated as the upper confidence limit for given coverage level. In this RI, parametric UTLs represent the upper 95 % confidence limit for 95 % coverage. That is, one can be 95 % confident that 95 % of the background concentrations for

the analyte of interest will fall below the UTL. For data that do not follow a known distribution, nonparametric UTLs are calculated. At the 95 % confidence level, the coverage provided by a nonparametric UTL generally is less than 95 %. Although the nonparametric UTL is chosen to maximize the coverage, 95 % coverage often is not achievable given the sample size.

When the coverage is high (95 % or greater), there is a relatively small chance, on the order of 1 in 20, that a sample taken from an uncontaminated area will have an inorganic concentration greater than the UTL. When individual sample results are compared to UTLs, they are interpreted to indicate the presence of potential contamination when they exceed the UTLs.

## **2.0     Calculation of Background UTLs**

UTLs were calculated for the background data so that individual site results could be compared to background levels. In calculating UTLs, the distribution of the data must be considered.

Normality tests were performed on the data and the logs of the data using the Shapiro Wilk test (Gilbert, 1987; Shapiro and Wilk, 1965). UTLs were calculated for background and upgradient data sets that were normally distributed using the following formula for normal distributions:

$$UTL = \bar{x} + (K \times s)$$

where  $\bar{x}$  is the estimated sample mean, K is the tolerance factor, and s is the estimated standard deviation. For data sets that were lognormally distributed, the same formula as provided above was used, with the logs of the data used in all calculations. The exponent of the result was

taken to arrive at the lognormal UTL. Normal and lognormal UTLs were calculated for the 95th percentile (i.e., a coverage of 95 %) with 95 % confidence.

For background data sets that were not normally or lognormally distributed, nonparametric UTLs were estimated as the maximum background concentration. The coverage for non-parametric UTLs is a function of the sample size and was often less than the coverage of 95 % used for the parametric (normal or lognormal) UTLs.

For background data sets where fewer than ten percent of the concentrations were measurable (measurable concentrations are J-flagged values or concentrations above the detection limit), the calculation of a UTL was inappropriate. For those cases, two times the maximum detection limit was used as the level to which all individual site concentrations should be compared. Note that no statements of degree of confidence or coverage provided can be made in these cases.

Tables D-1 and D-2 present the UTLs for groundwater, surface water, surface soil and subsurface soil background samples collected from the Galena Ambient Location and for surface soil background samples collected from the Campion Ambient Location.

Table D-1  
Groundwater and Surface Water Background Summary Statistics

Matrix	Site	Method	Analyte	Min	Max	Mean	N	Upper Tolerance Limit	Units	Test Type	Coverage (%)
GW	Galena	SW6010	Aluminum	-0.032	0.100	0.042	6	0.241	mg/L	Normal	95.00
GW	Galena	SW6010	Antimony	0.003	0.050	0.032	6	0.100	mg/L	Normal	95.00
GW	Galena	SW7060	Arsenic	-0.005	0.019	0.004	8	0.027	mg/L	Normal	95.00
GW	Galena	SW6010	Barium	0.210	0.537	0.374	6	0.893	mg/L	Normal	95.00
GW	Galena	SW6010	Beryllium	-0.002	0.001	0.000	6	0.005	mg/L	Normal	95.00
GW	Galena	SW6010	Cadmium	-0.000	0.003	0.001	6	0.006	mg/L	Normal	95.00
GW	Galena	SW6010	Calcium	160.000	326.000	231.333	6	498.563	mg/L	Normal	95.00
GW	Galena	SW6010	Chromium	-0.001	0.005	0.003	6	0.011	mg/L	Normal	95.00
GW	Galena	SW6010	Cobalt	-0.004	0.038	0.018	6	0.079	mg/L	Normal	95.00
GW	Galena	SW6010	Copper	0.003	0.010	0.006	6	0.019	mg/L	Normal	95.00
GW	Galena	SW6010	Iron	-0.003	18.000	4.980	6	30.662	mg/L	Normal	95.00
GW	Galena	SW7421	Lead	-0.047	0.016	-0.004	8	0.016	mg/L	Non-Parametric	68.77
GW	Galena	SW6010	Magnesium	27.000	73.600	47.450	6	125.328	mg/L	Normal	95.00
GW	Galena	SW6010	Manganese	0.027	23.100	10.367	6	45.351	mg/L	Normal	95.00
GW	Galena	SW7470	Mercury	0.000	0.000	0.000	4	0.001	mg/L	Normal	95.00
GW	Galena	SW6010	Molybdenum	-0.004	0.025	0.008	6	0.058	mg/L	Normal	95.00
GW	Galena	SW6010	Nickel	-0.004	0.102	0.036	6	0.179	mg/L	Normal	95.00
GW	Galena	SW6010	Potassium	4.600	7.300	5.920	6	10.312	mg/L	Normal	95.00
GW	Galena	SW7740	Selenium	-0.003	0.027	0.005	6	0.027	mg/L	Non-Parametric	60.70
GW	Galena	SW6010	Silver	-0.002	0.005	0.002	6	0.015	mg/L	Normal	95.00
GW	Galena	SW6010	Sodium	4.500	11.300	7.302	6	17.051	mg/L	Normal	95.00
GW	Galena	SW6010	Thallium	-0.101	0.050	-0.011	6	0.202	mg/L	Normal	95.00
GW	Galena	SW6010	Vanadium	-0.004	0.010	0.003	6	0.025	mg/L	Normal	95.00
GW	Galena	SW6010	Zinc	0.001	0.019	0.011	6	0.034	mg/L	Normal	95.00
SW	Galena	SW6010	Aluminum	0.100	0.100	0.100	4	0.400	mg/L	Twice Max DL	.
SW	Galena	SW6010	Antimony	0.050	0.050	0.050	4	0.200	mg/L	Twice Max DL	.
SW	Galena	SW7060	Arsenic	0.002	0.002	0.002	4	0.008	mg/L	Twice Max DL	.
SW	Galena	SW6010	Barium	0.057	0.086	0.066	4	0.086	mg/L	Non-Parametric	47.29
SW	Galena	SW6010	Beryllium	0.001	0.001	0.001	4	0.004	mg/L	Twice Max DL	.
SW	Galena	SW6010	Cadmium	0.003	0.003	0.003	4	0.010	mg/L	Twice Max DL	.
SW	Galena	SW6010	Calcium	33.000	45.000	37.000	4	74.805	mg/L	Lognormal	95.00
SW	Galena	SW6010	Chromium	0.005	0.005	0.005	4	0.020	mg/L	Twice Max DL	.
SW	Galena	SW6010	Cobalt	0.005	0.005	0.005	4	0.020	mg/L	Twice Max DL	.
SW	Galena	SW6010	Copper	0.010	0.020	0.013	4	0.020	mg/L	Non-Parametric	47.29
SW	Galena	SW6010	Iron	0.330	1.000	0.565	4	5.890	mg/L	Lognormal	95.00
SW	Galena	SW7421	Lead	0.002	0.010	0.005	4	0.025	mg/L	Normal	95.00
SW	Galena	SW6010	Magnesium	6.500	7.800	6.875	4	7.800	mg/L	Non-Parametric	47.29
SW	Galena	SW6010	Manganese	0.050	0.160	0.096	4	1.092	mg/L	Lognormal	95.00
SW	Galena	SW7470	Mercury	0.000	0.000	0.000	4	0.000	mg/L	Twice Max DL	.
SW	Galena	SW6010	Molybdenum	0.025	0.025	0.025	4	0.100	mg/L	Twice Max DL	.
SW	Galena	SW6010	Nickel	0.010	0.010	0.010	4	0.040	mg/L	Twice Max DL	.
SW	Galena	SW6010	Potassium	3.800	4.900	4.225	4	7.328	mg/L	Lognormal	95.00
SW	Galena	SW7740	Selenium	0.003	0.003	0.003	4	0.010	mg/L	Twice Max DL	.
SW	Galena	SW6010	Silver	0.005	0.005	0.005	4	0.020	mg/L	Twice Max DL	.
SW	Galena	SW6010	Sodium	1.900	2.700	2.150	4	2.700	mg/L	Non-Parametric	47.29
SW	Galena	SW6010	Thallium	0.050	0.050	0.050	4	0.200	mg/L	Twice Max DL	.
SW	Galena	SW6010	Vanadium	0.010	0.010	0.010	4	0.040	mg/L	Twice Max DL	.
SW	Galena	SW6010	Zinc	0.010	0.039	0.017	4	0.039	mg/L	Non-Parametric	47.29



Table D-2  
Surface and Subsurface Soil Background Summary Statistics

Matrix	Site	Method	Analyte	Min	Max	Mean	N	Upper	Units	Test	Coverage (%)
								Tolerance Limit			
SB	Galena	SW6010	Aluminum	10000.00	16000.00	13250.00	4	26112.50	mg/kg	Normal	95.00
SB	Galena	SW6010	Antimony	6.00	8.00	6.88	4	32.00	mg/kg	Twice Max DL	.
SB	Galena	SW7060	Arsenic	11.00	14.00	12.25	4	20.45	mg/kg	Lognormal	95.00
SB	Galena	SW6010	Barium	180.00	240.00	217.50	4	352.81	mg/kg	Normal	95.00
SB	Galena	SW6010	Beryllium	0.15	0.38	0.26	4	0.88	mg/kg	Normal	95.00
SB	Galena	SW6010	Cadmium	0.30	0.39	0.34	4	1.56	mg/kg	Twice Max DL	.
SB	Galena	SW6010	Calcium	11000.00	15000.00	13000.00	4	22393.44	mg/kg	Normal	95.00
SB	Galena	SW6010	Chromium	23.00	32.00	28.25	4	48.12	mg/kg	Normal	95.00
SB	Galena	SW6010	Cobalt	12.00	13.00	12.50	4	13.00	mg/kg	Non-Parametric	47.29
SB	Galena	SW6010	Copper	27.00	40.00	33.75	4	61.42	mg/kg	Normal	95.00
SB	Galena	SW6010	Iron	23000.00	28000.00	25750.00	4	36356.69	mg/kg	Normal	95.00
SB	Galena	SW7421	Lead	8.20	10.00	9.03	4	13.76	mg/kg	Lognormal	95.00
SB	Galena	SW6010	Magnesium	7300.00	8000.00	7775.00	4	9474.93	mg/kg	Normal	95.00
SB	Galena	SW6010	Manganese	400.00	430.00	412.50	4	481.82	mg/kg	Lognormal	95.00
SB	Galena	SW7471	Mercury	0.15	0.26	0.19	4	0.65	mg/kg	Lognormal	95.00
SB	Galena	SW6010	Molybdenum	3.00	3.90	3.41	4	15.60	mg/kg	Twice Max DL	.
SB	Galena	SW6010	Nickel	27.00	32.00	30.50	4	42.75	mg/kg	Normal	95.00
SB	Galena	SW6010	Potassium	1100.00	1600.00	1275.00	4	3145.48	mg/kg	Lognormal	95.00
SB	Galena	SW7740	Selenium	0.29	0.46	0.35	4	1.84	mg/kg	Twice Max DL	.
SB	Galena	SW6010	Silver	0.60	0.80	0.69	4	3.20	mg/kg	Twice Max DL	.
SB	Galena	SW6010	Sodium	330.00	500.00	405.00	4	976.36	mg/kg	Lognormal	95.00
SB	Galena	SW6010	Thallium	6.00	8.00	6.88	4	32.00	mg/kg	Twice Max DL	.
SB	Galena	SW6010	Vanadium	39.00	54.00	46.00	4	91.81	mg/kg	Lognormal	95.00
SB	Galena	SW6010	Zinc	67.00	92.00	81.75	4	137.38	mg/kg	Normal	95.00
SS	Campion	SW6010	Aluminum	2470.00	10900.00	7033.33	6	19562.04	mg/kg	Normal	95.00
SS	Campion	SW6010	Antimony	-18.00	-1.45	-5.55	6	25.20	mg/kg	Twice Max DL	.
SS	Campion	SW7060	Arsenic	2.64	14.90	7.23	6	69.29	mg/kg	Lognormal	95.00
SS	Campion	SW6010	Barium	127.00	1940.00	484.67	6	1940.00	mg/kg	Non-Parametric	60.70
SS	Campion	SW6010	Beryllium	0.05	0.35	0.23	6	0.66	mg/kg	Normal	95.00
SS	Campion	SW6010	Cadmium	-0.07	1.68	0.40	6	3.74	mg/kg	Twice Max DL	.
SS	Campion	SW6010	Calcium	3490.00	29600.00	11845.00	6	208399.2	mg/kg	Lognormal	95.00
SS	Campion	SW6010	Chromium	6.94	20.90	14.09	6	34.93	mg/kg	Normal	95.00
SS	Campion	SW6010	Cobalt	4.37	86.60	19.91	6	86.60	mg/kg	Non-Parametric	60.70
SS	Campion	SW6010	Copper	7.18	25.70	13.05	6	62.81	mg/kg	Lognormal	95.00
SS	Campion	SW6010	Iron	10200.00	136000.00	35783.33	6	136000.0	mg/kg	Non-Parametric	60.70
SS	Campion	SW7421	Lead	1.17	9.65	6.06	6	16.73	mg/kg	Normal	95.00
SS	Campion	SW6010	Magnesium	1830.00	4640.00	3380.00	6	7597.45	mg/kg	Normal	95.00
SS	Campion	SW6010	Manganese	147.00	28100.00	5023.00	6	28100.00	mg/kg	Non-Parametric	60.70
SS	Campion	SW7471	Mercury	-0.06	0.04	-0.02	6	0.20	mg/kg	Twice Max DL	.
SS	Campion	SW6010	Molybdenum	0.25	5.85	1.56	6	44.32	mg/kg	Lognormal	95.00
SS	Campion	SW6010	Nickel	10.50	29.80	19.38	6	85.16	mg/kg	Lognormal	95.00
SS	Campion	SW6010	Potassium	177.00	1060.00	455.83	6	3343.49	mg/kg	Lognormal	95.00
SS	Campion	SW7740	Selenium	0.87	3.26	2.19	6	5.04	mg/kg	Normal	95.00
SS	Campion	SW6010	Silver	-1.05	-0.31	-0.52	6	2.38	mg/kg	Twice Max DL	.
SS	Campion	SW6010	Sodium	89.60	301.00	169.60	6	1068.98	mg/kg	Lognormal	95.00
SS	Campion	SW6010	Thallium	-19.10	0.68	-3.38	6	90.40	mg/kg	Twice Max DL	.
SS	Campion	SW6010	Vanadium	13.80	40.70	26.78	6	121.99	mg/kg	Lognormal	95.00
SS	Campion	SW6010	Zinc	18.00	78.00	39.70	6	210.87	mg/kg	Lognormal	95.00
SS	Galena	SW6010	Aluminum	5400.00	14000.00	12057.14	7	14000.00	mg/kg	Non-Parametric	65.18
SS	Galena	SW6010	Antimony	4.15	7.50	6.09	7	30.00	mg/kg	Twice Max DL	.
SS	Galena	SW7060	Arsenic	4.20	15.00	11.46	7	15.00	mg/kg	Non-Parametric	65.18

Table D-2  
Surface and Subsurface Soil Background Summary Statistics

Matrix	Site	Method	Analyte	Min	Max	Mean	N	Upper Tolerance Limit	Units	Test Type	Coverage (%)
SS	Galena	SW6010	Barium	70.00	250.00	187.14	7	380.13	mg/kg	Normal	95.00
SS	Galena	SW6010	Beryllium	0.09	0.36	0.28	7	0.36	mg/kg	Non-Parametric	65.18
SS	Galena	SW6010	Cadmium	0.21	0.37	0.31	7	1.48	mg/kg	Twice Max DL	.
SS	Galena	SW6010	Calcium	4300.00	15000.00	12328.57	7	15000.00	mg/kg	Non-Parametric	65.18
SS	Galena	SW6010	Chromium	9.70	30.00	25.10	7	30.00	mg/kg	Non-Parametric	65.18
SS	Galena	SW6010	Cobalt	7.00	14.00	11.86	7	14.00	mg/kg	Non-Parametric	65.18
SS	Galena	SW6010	Copper	9.70	37.00	28.53	7	60.08	mg/kg	Normal	95.00
SS	Galena	SW6010	Iron	11000.00	27000.00	22714.29	7	27000.00	mg/kg	Non-Parametric	65.18
SS	Galena	SW7421	Lead	2.70	11.00	7.80	7	17.15	mg/kg	Normal	95.00
SS	Galena	SW6010	Magnesium	2600.00	8700.00	7114.29	7	8700.00	mg/kg	Non-Parametric	65.18
SS	Galena	SW6010	Manganese	200.00	540.00	405.71	7	766.96	mg/kg	Normal	95.00
SS	Galena	SW7471	Mercury	0.08	0.20	0.16	7	0.30	mg/kg	Normal	95.00
SS	Galena	SW6010	Molybdenum	2.10	3.70	3.06	7	14.80	mg/kg	Twice Max DL	.
SS	Galena	SW6010	Nickel	17.00	34.00	28.86	7	34.00	mg/kg	Non-Parametric	65.18
SS	Galena	SW6010	Potassium	320.00	1600.00	1072.86	7	2378.52	mg/kg	Normal	95.00
SS	Galena	SW7740	Selenium	0.22	0.37	0.30	7	1.48	mg/kg	Twice Max DL	.
SS	Galena	SW6010	Silver	0.42	0.75	0.61	7	3.00	mg/kg	Twice Max DL	.
SS	Galena	SW6010	Sodium	41.50	470.00	378.79	7	470.00	mg/kg	Non-Parametric	65.18
SS	Galena	SW6010	Thallium	4.15	7.50	6.09	7	30.00	mg/kg	Twice Max DL	.
SS	Galena	SW6010	Vanadium	20.00	48.00	41.29	7	48.00	mg/kg	Non-Parametric	65.18
SS	Galena	SW6010	Zinc	27.00	82.00	67.86	7	82.00	mg/kg	Non-Parametric	65.18

**APPENDIX E**

**Field Documents**

**1992 Drilling Logs**

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	60.00	START DATE	8/3/92	FINISH DATE	8/3/92
GEOLOGIST	Paul A. Coplen	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish		
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg		
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Fire Training Area				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				<u>Sandy Silt</u> : olive gray (5Y 3/2), fine grained, soft, low plasticity, slightly moist; very sandy silt. (ML)		143.20	Logged from cuttings, 0'-5'.
5	3/1/3/3	100		<u>Sandy Silt</u> : moderate olive brown (5Y 4/4), very fine grained, very soft sand, low plasticity, moist; organic matter in core. (ML)		140	BZ PID = 0 ppm.
10	1/0/0/0			<u>Sand</u> : light olive gray (5Y 5/2), fine grained, poorly graded, round, wet. (SP) <u>Sand</u> : as above, fine to medium grained; organic fragments, sand grains increasing in size with depth. (SP)		135	Headspace = 3.0 ppm.
15	1/2/3	100		<u>Silty Sand</u> : olive gray (5Y 3/2), fine grained, poorly graded, round, soft, wet. (SM) <u>Silty Sand</u> : light olive gray (5Y 5/2), very fine grained, poorly graded, very soft; oxidation laminae < 2mm, blackish laminae < 10mm. (SM)		130	Sand grains appear to stick to Splt Spn when deconning. Core temp = 8 C. Foamy soaplike substance on end of E-line when checking water ^C level. BZ PID = 0 ppm, cuttings = 0.0.
20	1/0/0/0	100		<u>Sand</u> : olive gray (5Y 3/2), fine grained, poorly graded, round, wet; few medium grains sand dispersed throughout. (SP)		125	Slow drilling, BZ PID = 0 ppm, cuttings = 1-4 ppm.
25	1/1/0/0	NR		<u>Sand</u> : as above.		120	BZ PID = 0 ppm, cuttings = 1-3 ppm.
							No recovery, sample fell out of Splt Spn. 2.5' Heave in augers when try to resume drilling.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

## LOG OF DRILLING OPERATIONS

PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30				<b>Sand</b> : fine to medium grained.			Logged from cuttings.
35				<b>Sand</b> : medium grained; many large sand grains and small gravels on augers as they are pulled, increase with depth.			
40							
45							
50							
55							
60				End of Borehole at 60' BGL.			

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	30.00	START DATE	8/6/92	FINISH DATE	8/6/92
GEOLOGIST	Paul A. Coplen	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Fire Training Area				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		143.10	
				<u>Sandy Silt</u> (SM)			Logged from cuttings, 0'-5'. BH PID = 0 ppm, cuttings = 0.0.
5	2/1/1/2	100		<u>Silty Sand</u> : light olive gray (5Y 3/2), fine grained, poorly graded, moist; very silty, layer of silt with oxidation stains and organic material from 6.0' to 6.5', increase sand content with depth. (SM)			BZ PID = 0 ppm, cuttings = 0.0. No odor, no OVM hit.
10	1/1/1	100		<u>Silt</u> : olive gray (5Y 3/2), wet; silts laminated with fine and medium grained sand 1-3mm thick laminae, dusky yellow (5Y 6/4). (ML)			BZ PID = 0 ppm, cuttings = 0.0.
15	1/1/1	100		<u>Silty Sand</u> : olive gray (5Y 3/2), fine grained, poorly graded, round, wet. (SM) <u>Silt</u> : no lith-description; few gravel, = < 10mm, sub-round. (ML)			
20	1/2/3	100		<u>Sand</u> : olive gray (5Y 3/2), fine grained, poorly graded, round, wet. (SP) <u>Silt</u> : no lith-description; 3" silt laminae. (ML)			BZ PID = 0 ppm.
25	40/50+	100		<u>Sand</u> : light olive gray (5Y 5/2), fine to medium grained, well graded, round, wet; encountered permafrost. (SW)			BZ PID = 0 ppm, cuttings = 0.0. Permafrost.
	4/4/3/3	100		<u>Sand</u> : as above. (SW)			BZ PID = 0 ppm, cuttings = 0.0. Gravel seen on lead auger when pulled from


**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million


PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	X			End of Borehole at 30' BGL.			hole.



**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	9.50	START DATE	8/8/92
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Fire Training Area		

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0						143.20	
	3/3/3/4	60		<u>Gravelly Silt</u> : pale red (5R 6/2), loose, non-plastic, dry; some roots and slightly layered. (ML) <u>Sandy Silt</u> : grayish brown (5YR 3/2). (ML)		140	Headspace = 10.2 ppm.
5	4/3/3/3	60		<u>Gravelly Sand</u> : brownish gray (5YR 4/1), very fine grained, poorly graded, well rounded, moist; carbonaceous material, dry intervals, slightly organish staining, woody plant remains. (SP)			Headspace = 0 ppm.
	3/2/3/3			<u>Silty Sand</u> : dark yellow brown (10YR 4/2), very fine grained, poorly graded, well rounded, moist; slightly organish staining. (SM)		135	Headspace = 0 ppm.
				End of Borehole at 9.5' BGL.			

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	9.50	START DATE	8/8/92
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Fire Training Area		

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0						142.70	
	2/2/2/2		50	<b>Sandy Silt</b> : olive gray (5Y 4/1), fine grained, poorly graded, round, soft, non-plastic, dry; slightly compacted, some dark black blotches of staining. (ML)		140	Headspace = 117 ppm, from split spoon cuttings (grab sample).  Headspace = 201 ppm.
5			75	<b>Silty Sand</b> : light olive gray (5Y 6/1), fine grained, poorly graded, round, soft, moist; fine at top to coarse at bottom, some rootlets. (SM)			Headspace = 433 ppm.
	2/2/2/3		100	<b>Silty Sand</b> : olive gray (5Y 3/2), fine grained, poorly graded, round, firm, moist; more rootlets, plant remains, strong odor, few pebbles. (SM)		135	Headspace = 730 ppm.
				End of Borehole at 9.5' BGL.			




**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	9.50	START DATE	FINISH DATE
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard
DRILLING COMPANY	Hughes Drilling	DRILLER	Rod & Ricky
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Fire Training Area		

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0						142.70	
	2/2/2/2	2	50	<b>Sandy Silt</b> : olive gray (5Y 4/1), fine grained, poorly graded, round, soft, non-plastic, dry; slightly compacted, some dark black blotches of staining.		140	117 ppm from split spoon cuttings (grab sample).  201 ppm.
5			75	<b>Silty Sand</b> : light olive gray (5Y 6/1), fine grained, poorly graded, round, soft, non-plastic, moist; fine at top to coarse at bottom, some rootlets.			433 ppm.
	2/2/2/3	3	100	<b>Silty Sand</b> : olive gray (5Y 3/2), fine grained, poorly graded, round, firm, non-plastic, moist; more rootlets, plant remains, strong odor, few pebbles.		135	730 ppm.
							Total Depth at 9.5' BGL.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	21.50	START DATE	FINISH DATE		
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard	R.G.# 275 - Alaska	
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish		
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg		
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Ambient Site				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				<b>Silty Gravel</b> : no lithologic description.		147.40	Very gravelly at surface.
5	1/1/1	70		<b>Sandy Silt</b> : brown, fine grained, poorly graded, sub-angular to sub-round, soft, low plasticity, moist; abundant organics, woodchips, and roots. (ML)		145	Headspace = 7.1 ppm.
10	1/1/1	100		<b>Silty Sand</b> : olive gray, fine grained, poorly graded, sub-round to sub-angular, soft, moist; coarsening downward, organics, rootlets, slight organish-brown motling in fine grained sand. (SM)		140	
15	2/1/1	100		<b>Gravelly Sand</b> : tan brown, medium grained, well graded, sub-angular to angular, soft, wet; lots of quartz pebbles, some larger pebbles, some black organic. (SW)		135	Water level at 13.8' BGL.
20	7/2/4	25		<b>Gravelly Sand</b> : coarse grained, well graded, sub-angular to sub-round, soft, wet; 50% mafic, 50% sialic. (SW)		130	OVM = 0.0 ppm. Permafrost from 20.5' to 21.5'.
				End of Borehole at 21.5' BGL.			

**\*\*NOTES\*\***

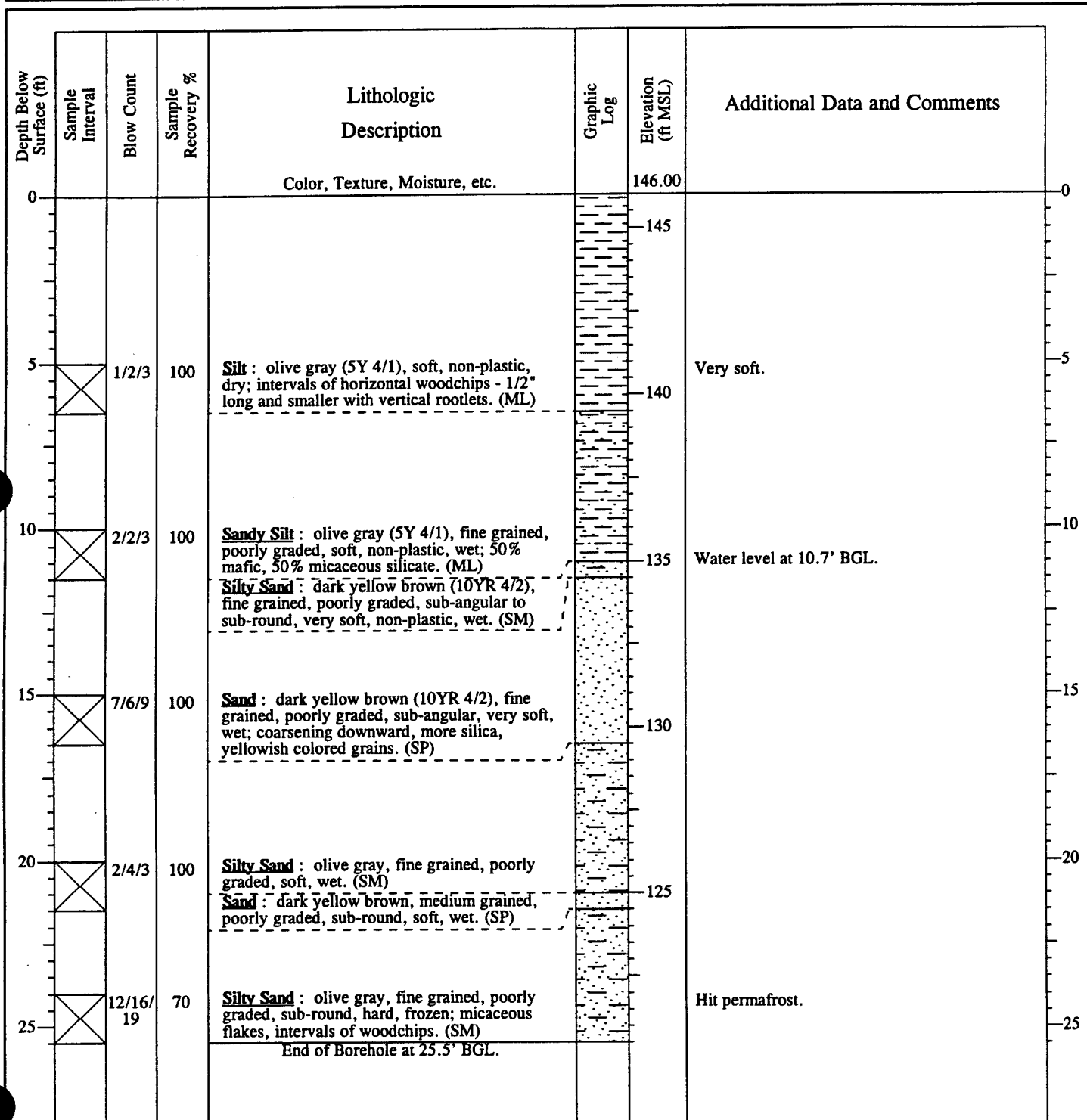
BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	25.50	START DATE	FINISH DATE		
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard	R.G.# 275 - Alaska	
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Ambient Site				


**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	60.00	START DATE	7/21/92	FINISH DATE	7/21/92
GEOLOGIST	B. J. Coel	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	POL Area				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		148.50	
				<u>Sandy Silt</u> : dark yellowish brown (10YR 4/2), very fine grained, poorly graded, soft, non-plastic, dry. (ML)			Logged from cuttings 0'-5'.
5	1/3/3	100		<u>Sandy Silt</u> : dark yellowish brown (10YR 4/2), very fine grained, poorly graded, soft, non-plastic, moist; some rounded gravel. (ML)		145	BH PID = 1.3 ppm, BZ PID = 1.3 ppm.
10	1/1/3/3	100		<u>Sandy Silt</u> : dark yellowish brown (10YR 4/2), very fine grained, poorly graded, soft, non-plastic, moist; trace clay with iron staining, trace woodchips. (ML)		140	Sample 10'-12', 05-MW-01-02. BH & BZ PID = 0 ppm. Headspace = 33.3 ppm.
15	2/1/3	100		<u>Sand</u> : dark yellowish brown (10YR 4/2), medium grained, poorly graded, sub-round, non-plastic, moist; approx. 5% coarse sand. (SP)		135	Water level at 13.2' BGL. BH PID = 2.7 ppm, BZ PID = 1.3 ppm.
20	2/2/2	100		<u>Gravelly Sand</u> : olive gray (5Y 4/1), medium grained, well graded, sub-round, non-plastic, moist. (SW)		130	Core temp = 14 C, sieve sample.
25	2/2/3	NR		<u>Sand</u> : dark yellowish brown (10YR, 4/2), fine to medium grained, wet. (SP)		125	BH PID = 1 ppm, BZ PID = 0 ppm, logged from cuttings. 3' Heave, no recovery.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT <u>Galena Stage 3 RI/FS</u>			LOCATION <u>Galena AFS Area, Alaska</u>				
Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	X	8/10/3	NR			120	BH PID = 1 ppm, BZ PID = 0 ppm. 4' Heave, no recovery.
35	X	6/10/10	NR			115	BH & BZ PID = 0 ppm. 6' Heave, no recovery.
40	X		NR			110	BH & BZ PID = 0 ppm. 8' Heave, no sample taken due to heave. Drilled to 60', no more samples taken.
45						105	
50						100	
55						95	
60				End of Borehole at 60' BGL.		90	

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	53.00	START DATE	7/23/92	FINISH DATE	7/23/92
GEOLOGIST	B. J. Coel	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	POL Area				


Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
				Color, Texture, Moisture, etc.		147.40	
0				<b>Gravelly Sand</b> : dark yellowish brown (10YR 4/2), fine grained, well graded, sub-round, dry. (SW)			Logged from cuttings, represents 0'-5'. Looks like fill.
5						145	
5/3/3/3	87.5			<b>Sandy Silt</b> : dark yellowish brown (10YR 4/2), very fine grained, poorly graded, soft, non-plastic, moist. (ML) <b>Sand</b> : dark yellowish brown (10YR 4/2), fine grained, poorly graded, sub-angular, moist. (SP)		140	BH PID = 1 ppm, BZ PID = 1 ppm. Sample 7'-9', 05-MW-02-02.  Headspace = 11.3 ppm.
10						135	Water level at 12.4' BGL.
15	2/2/2	100		<b>Sand</b> : dark yellowish brown (10YR 4/2), fine grained, poorly graded, sub-angular, moist; approx. 10% coarse sand, trace gravel. (SP)		130	BH PID = 3 ppm, BZ PID = 1 ppm.
20	3/1/1	100		<b>Sand</b> : dark yellowish brown (10YR 4/2), fine grained, poorly graded, sub-angular, wet; trace medium sand, trace woodchips. (SP)		125	BH & BZ PID = 0 ppm.
25	2/2/2	100		<b>Sand</b> : dark yellowish brown (10YR 4/2), fine grained, poorly graded, sub-angular, wet; trace medium sand. (SP)		120	BZ PID = 0 ppm, BH PID = missed.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

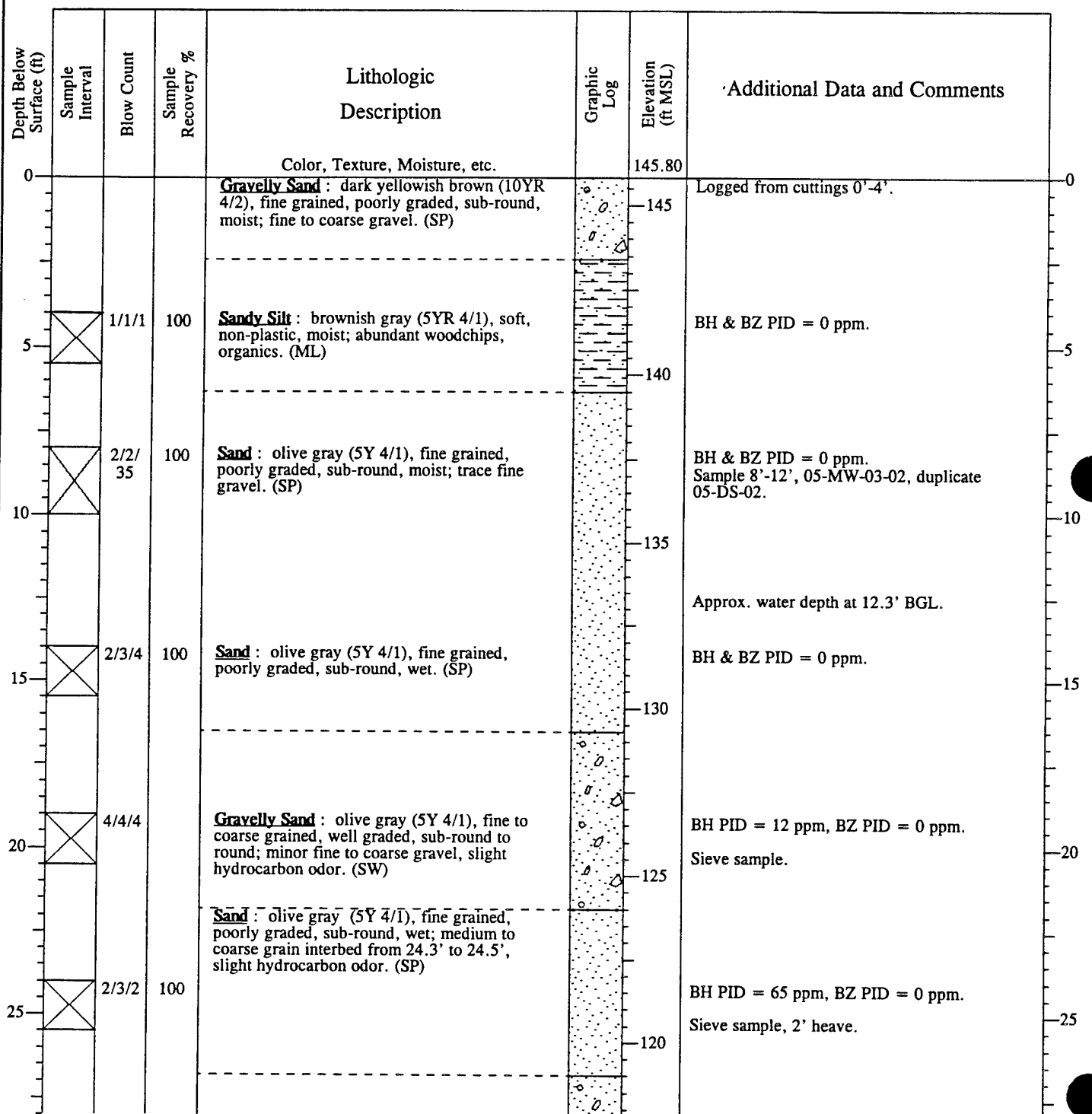


**LOG OF DRILLING OPERATIONS**

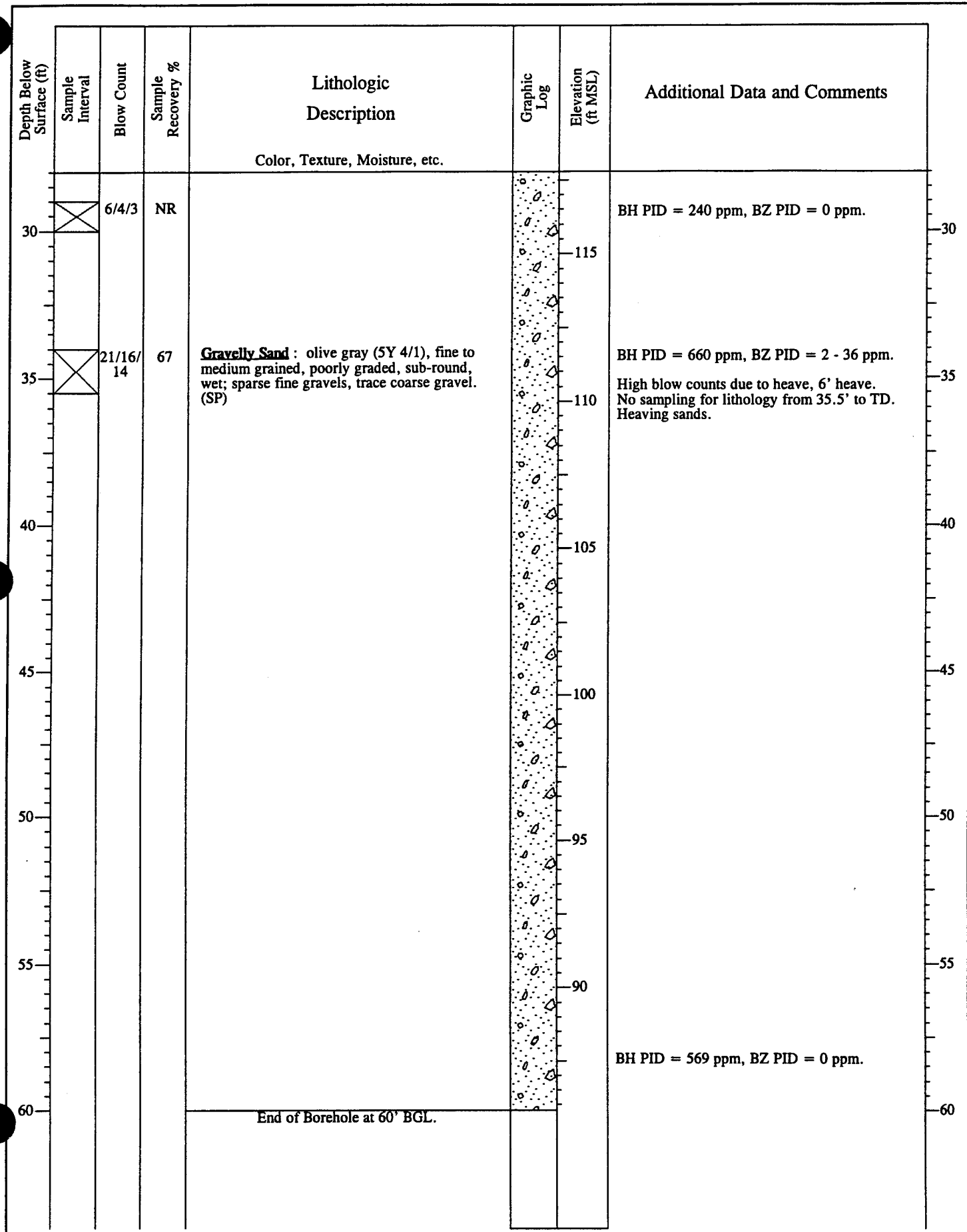
PROJECT		Galena Stage 3 RI/FS		LOCATION		Galena AFS Area, Alaska	
Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	X	4/6/6	100	<b>Sand</b> : dark yellowish brown (10YR 4/2), fine grained, poorly graded, sub-angular, wet; trace medium and coarse sand. (SP)		115	BH PID = 1 ppm, BZ PID = 0 ppm. Slight heaving.
35	X	7/14/12	100	<b>Sand</b> : dark yellowish brown (10YR 4/2), medium grained, poorly graded, sub-angular, wet; trace medium and coarse sand, trace woodchips. (SP) <b>Sand</b> : dark yellowish brown (10YR 4/2), coarse grained, well graded, sub-angular, wet; trace gravel, trace woodchips, approx. 20% medium sand. (SP)		110	BH PID = 1 ppm, BZ PID = 0 ppm, core temp = 15 C.
40	X	3/5/6	83	<b>Sand</b> : olive gray (5Y 4/1), coarse grained, well graded, sub-round, wet; trace gravel, approx. 20% medium and fine sand. (SP)		105	BH PID = 1 ppm, BZ PID = 0 ppm.
45	X		NR			100	BH & BZ PID = 0 ppm. No recovery.
50						95	Drilled to 53' and installed well at 51'.
				End of Borehole at 53' BGL.			

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	60.00	START DATE	7/22/92	FINISH DATE	7/22/92
GEOLOGIST	GJC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	POL Area				


**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska


**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	50.00	START DATE	7/30/92	FINISH DATE	7/30/92
GEOLOGIST	B. J. Coel	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	POL Area				


Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		143.60	
				<u>Sandy Silt</u> : olive black (5Y 2/1), very fine grained, poorly graded, soft, medium plasticity, moist. (MH)			Logged from cuttings, 0'-8'. Background PID = 1 ppm.
5						140	
10	4/3/4/4		75	<u>Sand</u> : olive gray (5Y 4/1), fine grained, poorly graded, sub-angular, wet; trace coarse sand, strong hydrocarbon odor. (SP)		135	BH PID = 500 ppm, BZ PID = 3 ppm. Water level at 8.67' BGL. Sample 8'-10', 05-MW-04-02. Brass sleeves loaded incorrectly, no recovery in sleeves.
15	1/1/2		100	<u>Sand</u> : olive gray (5Y 4/1), fine grained, well graded, sub-angular, wet; 10% coarse sand, trace gravel, strong hydrocarbon odor. (SP)		130	BH PID = 500 ppm, BZ PID = 3 ppm.
20	1/1/2		33	<u>Sand</u> : olive gray (5Y 4/1), fine grained, poorly graded, sub-angular, wet; strong hydrocarbon odor. (SP)		125	BH PID = 421 ppm, BZ PID = 3 ppm. 1.5' Heave, temp = 12 C. PID on cuttings = 750 ppm.
25	1/1/2			<u>Sand</u> : olive gray (5Y 4/1), fine grained, poorly graded, sub-angular, wet; hydrocarbon odor. (SP)		120	BH PID = 625 ppm, BZ PID = <5 ppm. Temp = 10 C. PID on cuttings = 600 ppm.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

 PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	X	7/8/6		<b>Sand</b> : olive gray (5Y 4/1), fine grained, poorly graded, sub-angular, wet; trace coarse sand, trace gravel, faint hydrocarbon odor. (SP)		115	BH PID = 330 ppm, BZ PID = 1 ppm. Temp = 9 C, 6' heave. Too much heave, quit sampling, installed well at 47'.
35						110	
40						105	
45						100	
50				End of Borehole at 50' BGL.		95	

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	40.00	START DATE	7/31/92	FINISH DATE	7/31/92
GEOLOGIST	B. J. Coel	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	POL Area				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		143.20	
				<u>Sandy Silt</u> : olive black (5Y 2/1), very fine grained, poorly graded, soft, non-plastic, moist; hydrocarbon odor. (ML)			Logged from cuttings, 0'-5'. PID on cuttings = 44 ppm, BZ PID = 3 ppm.
5	3/2/12		100	<u>Sandy Silt</u> : olive black (5Y 2/1), very fine grained, poorly graded, soft, non-plastic, moist; lots of wood, strong hydrocarbon odor. (ML)		140	Headspace = 500 ppm. Sample 5'-7', 05-MW-05-02.
10	1/1/2		100	<u>Sandy Silt</u> : olive black (5Y 2/1), very fine grained, poorly graded, soft, non-plastic, wet. (ML) <u>Sand</u> : olive black (5Y 2/1), fine grained, poorly graded, sub-angular, wet. (SP)		135	Water level at 9.6' BGL. BH PID = 25 ppm, BZ PID = 0 ppm. Temp = 11 C.
15	2/2/3		83	<u>Sand</u> : olive gray (5Y 4/1), fine grained, poorly graded, sub-angular, wet; approx. 1% medium sand concentrated in a 1 cm. wide layer at approx. 6', hydrocarbon odor, sheen on water. (SP)		130	PID on cuttings = 25 ppm. BH PID = 696 ppm, BZ PID = 3 ppm. Temp = 9 C.
20	3/7/5		100	<u>Sand</u> : olive gray (5Y 4/1), fine grained, poorly graded, sub-round, wet; strong hydrocarbon odor, trace woodchips. (SP)		125	BH PID = high, BZ PID = 3 ppm. Temp = 9 C.
25	2/2/2		33	<u>Sand</u> : olive gray (5Y 4/1), fine grained, poorly graded, sub-round, wet; trace wood. (SP) <u>Sand</u> : olive gray (5Y 4/1), coarse grained, well graded, sub-round, wet. (SP)		120	BH PID = 125 ppm, BZ PID = 3 ppm. 5' Heave, temp = 10 C, sample may be heave.

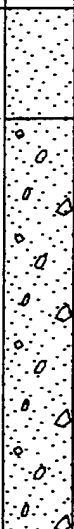

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

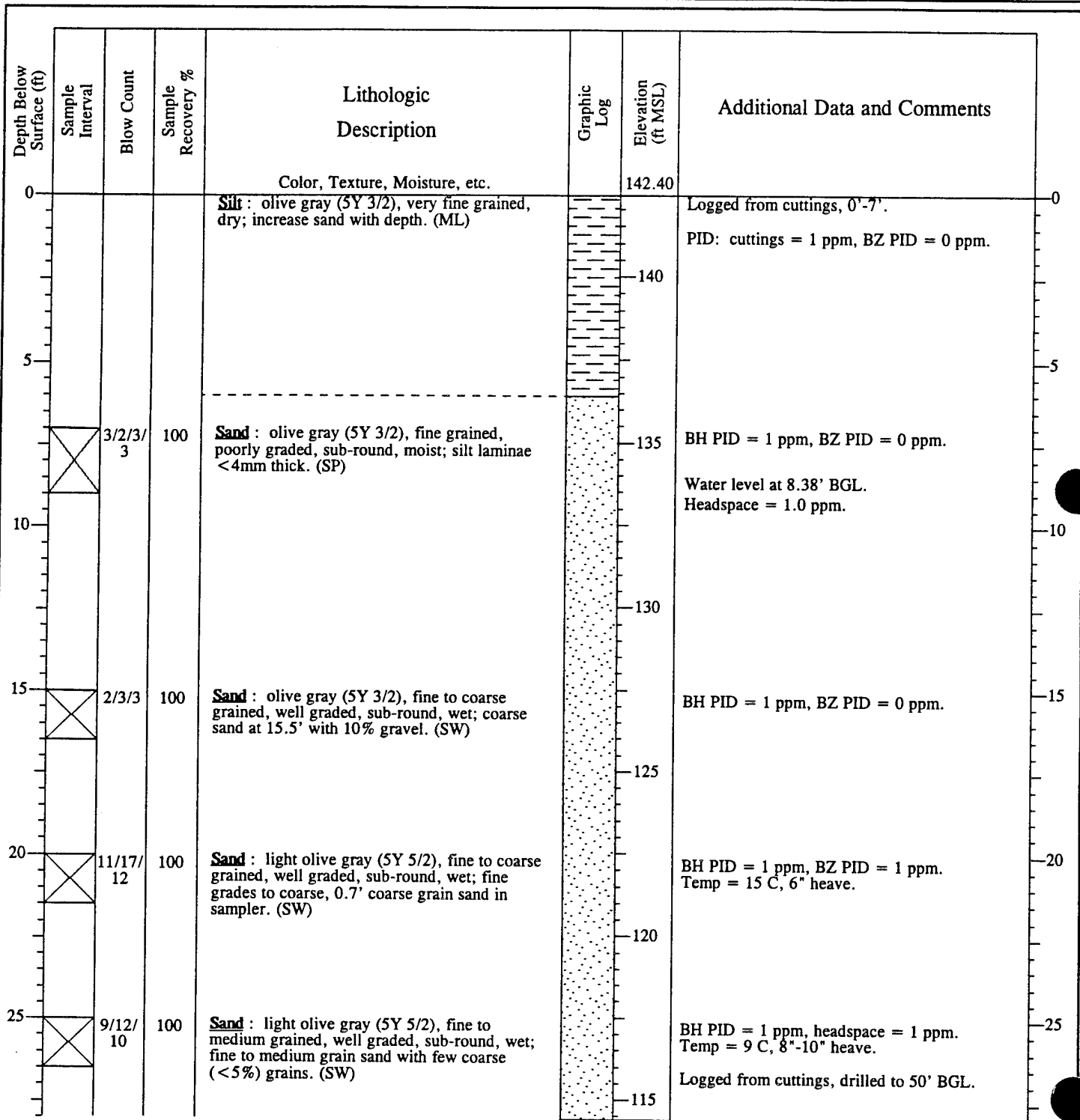
ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT		Galena Stage 3 RI/FS		LOCATION		Galena AFS Area, Alaska	
Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	X	9/10/8	100	<b>Sand</b> : olive gray (5Y 4/1), medium grained, well graded, sub-round, wet; 6" of heaved sand in sampler. (SP) <b>Sandy Gravel</b> : olive gray (5Y 4/1), fine grained, poorly graded, sub-round, wet; weak hydrocarbon odor. (GP)		110	Benzene Drager tube reading = 0 in BZ. BH PID = 190 ppm, BZ PID = 3 ppm. 7' Heave, temp = 9 C.
35	X	6/7/0	Trc.	<b>Sandy Gravel</b> : olive gray (5Y 4/1), fine grained, well graded, sub-round, wet; weak hydrocarbon odor, some coarse gravel and some coarse and medium sand. (GW)		105	BH PID = not taken, BZ PID = 3 ppm. 5' Heave, temp = 10 C, quit sampling due to heave.
40				End of Borehole at 40' BGL.			

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	50.00	START DATE	8/1/92	FINISH DATE	8/1/92
GEOLOGIST	P. A. Coplen	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	POL Area				


**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million



**LOG OF DRILLING OPERATIONS**

 PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30						110	
35						105	
40				<u>Gravelly Sand (SW)</u>		100	Easy to drill, advancing @ 0.3 ft/min.
45						95	
50				End of Borehole at 50' BGL.		50	

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	12.00	START DATE	7/20/92	FINISH DATE	7/20/92
GEOLOGIST	GJC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	POL				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		144.30	
				<u>Gravelly Sand</u> : grayish brown (5YR 3/2), fine grained, poorly graded, sub-round, moist; common fine to coarse gravel, silty. (SP)			Logged from cuttings.
	2/3/3/4		75	<u>Sandy Silt</u> : grayish black (N2), soft, non-plastic, moist; hydrocarbon odor, hydrocarbon stained, minor woodchips. (ML)			BH PID = 62 ppm, BZ PID = 0 ppm. sample 2'-4', 05-SB-01-01, headspace = 672 ppm.
5	1/1/2/3		100	<u>Sandy Silt</u> grayish black (N2), soft, non-plastic, moist; hydrocarbon odor and hydrocarbon stained. (ML)		140	BH PID = 67 ppm, BZ PID = 0 ppm. Sample 5'-7', 05-SB-01-02, headspace = 562 ppm.
	2/3/2/2		100	<u>Sand</u> : olive black (5Y 2/1), fine grained, poorly graded, sub-round, moist; hydrocarbon odor. (SP)			BH PID = 55 ppm, BZ PID = 0 ppm. Sample 8'-10', 05-SB-01-03, headspace 232 ppm.
10	2/3/3/3		100	<u>Sand</u> : olive black (5Y 2/1), fine grained, poorly graded, sub-round, wet; hydrocarbon odor. (SP)		135	BH PID = 62 ppm, BZ PID = 0 ppm. Split spoon sampler wet, no analytical sample collected.
				End of Borehole at 12' BGL.			

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	12.00	START DATE	7/21/92	FINISH DATE	7/21/92
GEOLOGIST	B. J. Coel	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	POL				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		144.00	
				<b>Sandy Silt</b> : dusky yellowish brown (10YR 2/2), very fine grained, poorly graded, soft, non-plastic, moist. (ML)			Logged from cuttings, 0' to 2'.
	3/3/3/3	3	75	<b>Sandy Silt</b> : dusky yellowish brown (10YR 2/2), very fine grained, poorly graded, soft, non-plastic, moist; trace woodchips. (ML)		140	BH PID = 158 ppm, BZ PID = 1 ppm. Sample 2'-4', 05-SB-02-01, headspace = 258 ppm.
5	2/1/1/1	1	100	<b>Sandy Silt</b> : olive brown (5Y 4/1), very fine grained, poorly graded, soft, non-plastic, moist; strong hydrocarbon odor. (ML)			BH PID = 148 ppm, BZ PID = 0 ppm. Sample 5'-7', 05-SB-02-02, headspace = 68 ppm. 4 ppm when split spoon opened.
	1/2/2/4	4	100	<b>Sandy Silt</b> : olive brown (5Y 4/1), very fine grained, poorly graded, soft, non-plastic, moist; strong hydrocarbon odor. (ML)		135	BH PID = 134 ppm, BZ PID = 1 ppm. Sample 8'-10', 05-SB-02-03, headspace = 48 ppm.
10	1/2/4/4	4	100	<b>Sand</b> : olive brown (5Y 4/1), fine grained, poorly graded, sub-round, soft, non-plastic, moist. (SP)			Water level at 9.6' BGL. BH PID = 143 ppm, BZ PID = 4.1 ppm.
				<b>Gravelly Sand</b> : olive brown (5Y 4/1), fine grained, poorly graded, sub-round, non-plastic, wet; very strong hydrocarbon odor. (ML)			Sample 10'-12', 05-SB-02-04, headspace = 63 ppm. Sending in sample due to heavy HC odor.
				End of Borehole at 12' BGL.			

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	12.00	START DATE	7/20/92	FINISH DATE	7/20/92
GEOLOGIST	GJC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell Trkrgr	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	POL				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		146.30	
				<u>Gravelly Sand</u> : grayish brown (5YR 3/2), fine grained, poorly graded, sub-round, moist; fine to coarse gravel, abundant silt. (SP)			Logged from cutting from 0'-3'. BH & BZ PID = 0 ppm.
						145	
							Sampler shoe jammed, no recovery from 3'-5' BGL.
5	2 1/2 / 3	NR					
				<u>Sandy Silt</u> : olive black (5Y 2/1), soft to fine, non-plastic, moist; abundant fines, minor woodchips, hydrocarbon odor. (ML)			BH PID = 42 ppm, BZ PID = 0.5 ppm. Sample 5'-7', duplicate 05-SB-03-01 & 05-DS-01.
						140	Headspace = 135 ppm. BH PID = 135 ppm, BZ PID = 0.5 ppm. Sample 7'-9', 05-SB-03-02, headspace = 152 ppm.
				<u>Sand</u> : medium dark gray (N4), fine grained, poorly graded, sub-round, moist to wet; hydrocarbon odor, becoming wet at 9' BGL. (SP)			
10	3 2/3 / 3	100		<u>Sand</u> : medium dark gray (N4), fine grained, poorly graded, sub-round, wet. (SP)			Water level at 10' BGL. BH PID = 127 ppm, BZ PID = 0.5 ppm.
						135	
				End of Borehole at 12' BGL.			

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	57.00	START DATE	7/18/92	FINISH DATE	7/18/92
GEOLOGIST	KLC, GJC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Waste Accumulation Area				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				<b>Sandy Gravel</b> : brownish black (5YR 2/1), fine grained, well graded, sub-round, dry; woodchips. (SP)		148.80	Logged from cuttings, background PID = 2 ppm.
5	2/3/4		67	<b>Silty Sand</b> : brownish black (5YR 2/1), very fine grained, well graded, sub-round, dry; woodchips, iron stain. (SM)		145	BH & BZ PID = 2 ppm. Lithologic sample only.
10	6/2/2/2		100	<b>Silty Sand</b> : dark yellowish brown (10YR 4/2), very fine grained, well graded, dry; organics, micaceous, some gravel. (SM)		140	Headspace = 22 ppm, sample 8'-10', 06-MW-02-02. BH & BZ PID = 2 ppm.
15	2/2/2		100	<b>Silty Sand</b> : dark yellowish brown (10YR 4/2), fine grained, poorly graded, sub-round, wet. (SM)		135	BH & BZ PID = 2 ppm.
20	2/2/2		100	<b>Silty Sand</b> : dark yellowish brown (10YR 4/2), fine grained, poorly graded, sub-round, wet. (SM)		130	BH PID = 148 ppm, BZ PID = 0 ppm. Sieve sample.
25	3/4/7		100	<b>Silty Sand</b> : dark yellowish brown (10YR 4/2), coarse, well graded, sub-round, wet; gravel interbeds, less silt. (SM)		125	BH PID = 10 ppm, BZ PID = 2 ppm, 2.5' heave.

**\*\*NOTES\*\***

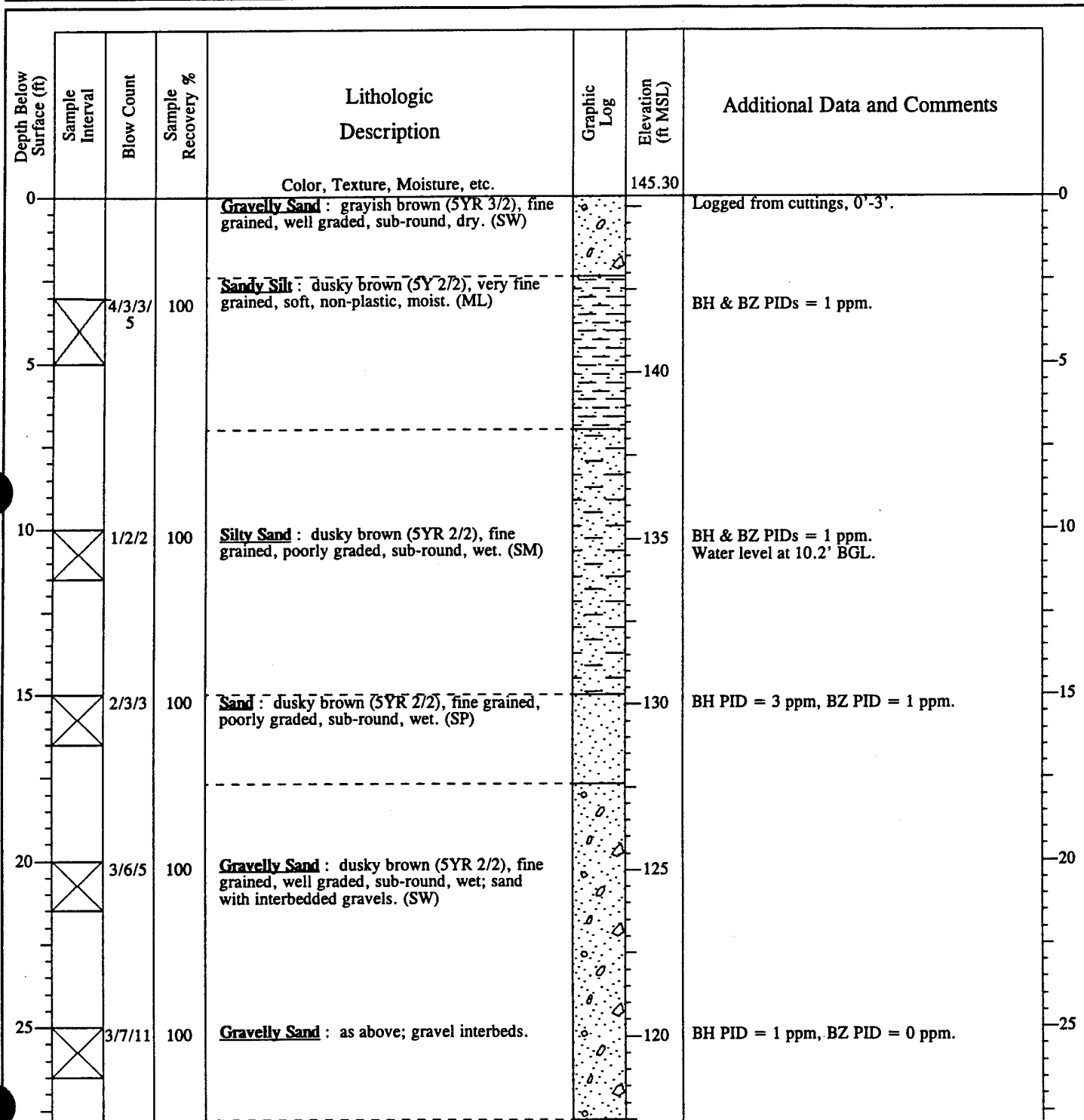
BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	5/26/24	100		<u>Gravelly Sand</u> : dusky brown (5YR 2/2), coarse to fine grained, well graded, sub-round, wet; top coarse sand with gravel grading to fine sand with gravel. (SW)		120	BH & BZ PID = 2 ppm, 2.5' heave.
35	7/6/4	67		<u>Silty Sand</u> : dark yellowish brown (10YR 4/2), fine grained, poorly graded; short loose sample. (SM)		115	BH PID = 6 ppm, BZ PID = 2 ppm, 5.5' heave.
40	9/14/9	100		<u>Sand</u> : dark gray (N3), fine grained, poorly to well graded, sub-round, wet; very coarse to fine. (SP-SW)		110	BH PID = 10 ppm, BZ PID = 2 ppm, 5.5' heave.
45	10/11/10	NR				105	BH & BZ PID = 2 ppm, 7' heave.
50						100	
55						95	
				End of Borehole at 57' BGL.			

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	55.00	START DATE	7/17/92	FINISH DATE	7/17/92
GEOLOGIST	KLC, GJC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Waste Accumulation Area				


**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

## LOG OF DRILLING OPERATIONS

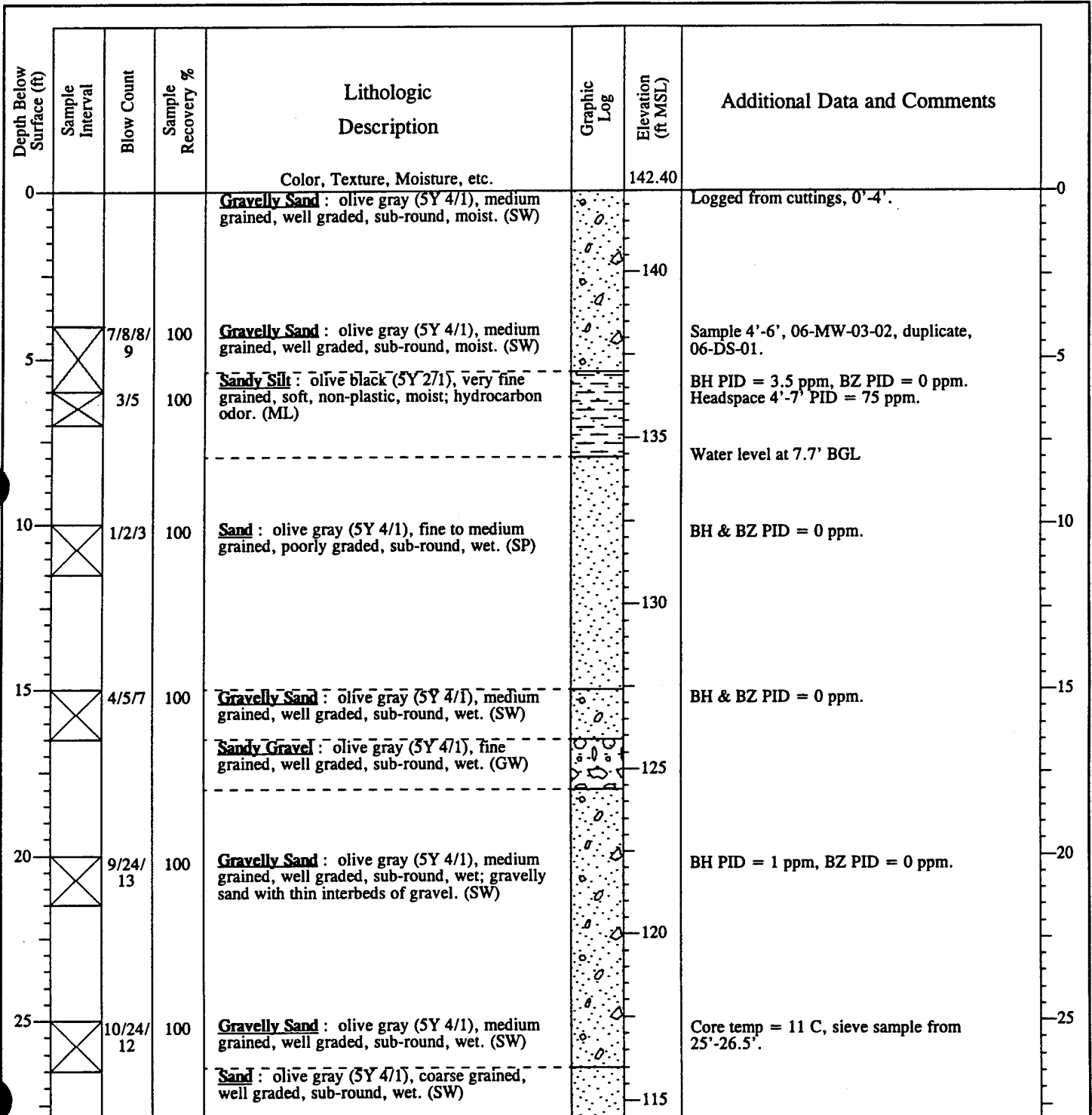
PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	1/2/3	100		<b>Sandy Gravel</b> : dusky brown (5YR 2/2), fine grained, well graded, sub-round, wet. (SW)		115	BH PID = 1 ppm, BZ PID = 0 ppm, 4' heave.
35	6/6/4	NR				110	7' Heave, no recovery, bottom of shoe filled with large gravel.
40	6/10/7	NR				105	10' Heave, no recovery, large gravel plugging sampler.
45	5/6/4	33		<b>Sand</b> : grayish black (N2), fine to medium grained, poorly graded, sub-round, wet. (SP) <b>Sandy Gravel</b> : grayish black (N2), fine grained, poorly graded, sub-round, wet. (SP)		100	BH PID = 1 ppm, BZ PID = 0 ppm, 8' heave.
50						95	
55				End of Borehole at 55' BGL.			



**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	50.00	START DATE	7/14/92	FINISH DATE	7/14/92
GEOLOGIST	KLC, GJC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Waste Accumulation Area				


**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

**LOG OF DRILLING OPERATIONS**

 PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	3/3/2	100		<b>Sand</b> : olive gray (5Y 4/1), coarse grained, well graded, sub-round, wet; larger coarser gravel. (SW)			BH & BZ PID = 0 ppm.
35	4/11/13	100		<b>Gravelly Sand</b> : olive gray (5Y 4/1), coarse, well graded, sub-round, wet; less gravel. (SW) <b>Sandy Gravel</b> : olive gray (5Y 4/1), fine grained, well graded, sub-round, wet. (GW)			BH & BZ PID = 0 ppm, core temp = 12 C.
40	5/10/7	100		<b>Sand</b> : olive gray (5Y 4/1), coarse grained, well graded, sub-round, wet; few fines, some gravel at 41.4'. (SW)			BH & BZ PID = 0 ppm, core temp = 12 C. 1.5' Heave, sieve sample from 40'-41.5'.
45							
50				End of Borehole at 50' BGL.			

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	50.00	START DATE	7/15/92	FINISH DATE	7/15/92
GEOLOGIST	GJC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Waste Accumulation Area				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				<b>Sandy Silt</b> : grayish brown (5YR 3/2), soft, non-plastic, moist; topsoil, very fine grain sand, abundant plant roots. (ML)		140.60	Logged from cuttings, 0'-4'.
5	2/2/2/3	100		<b>Sandy Silt</b> : grayish brown (5YR 3/2), soft, non-plastic, moist; scattered woodchips from 4' to 4.5', sparse iron staining, very fine grain sand. (ML)		135	BH PID = 1 ppm, BZ PID = 0.5 ppm. Sample 4'-6', 06-MW-04-02.  Headspace at 6' = 10 ppm. Water level at 6.4' BGL.
10	2/3/2	100		<b>Sand</b> : olive gray (5YR 4/1), fine grained, poorly graded, sub-round, wet; trace gravel, woodchips. (SP)		130	BH PID = 3.5 ppm, BZ PID 0.5 ppm.
15	3/3/2	100		<b>Sand</b> : medium dark gray (N4), fine grained, poorly graded, sub-round, wet; trace gravel, hydrocarbon odor. (SP)		125	BH PID = 38 ppm, BZ PID = 0.5 ppm.
20	3/2/3	100		<b>Gravelly Sand</b> : medium dark gray (N4), fine to medium grained, well graded, sub-round, wet; hydrocarbon odor. (SW)		120	BH PID = 385 ppm, BZ PID = 0.5 ppm.
25	2/3/3	100		<b>Sandy Gravel</b> : medium dark gray (N4), fine grained, well graded, sub-round, wet; hydrocarbon odor. (GW) <b>Gravelly Sand</b> : dark gray (N3), fine grained, poorly graded, sub-round, wet. (SP)		115	BH PID = 280 ppm, BZ PID = 0.5 ppm. Benzene Draeger tube at 25', BZ = 0 ppm, 1' heave.





**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	3/3/3	100		<b>Sand</b> : dark gray (N3), medium grained, poorly graded, sub-round, wet; hydrocarbon odor. (SP)		110	BH PID = 380 ppm, BZ PID = 1 ppm, 4' heave.
35	4/5/7	NR				105	BH PID = 290 ppm, BZ PID = 0.5 ppm.
40	2/5/6	NR		<b>Sand</b> : dark gray (N3), medium grained, well graded, sub-round, wet; hydrocarbon odor. (SW)		100	BH PID = 290 ppm, BZ PID = 2.5 ppm, 5' heave.
45						95	
50				End of Borehole at 50' BGL.			

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	12.00	START DATE	7/16/92	FINISH DATE	7/16/92
GEOLOGIST	KLC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	West Unit				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				<b>Sandy Gravel</b> : dusky brown (5Y 2/2), fine grained, well graded, sub-round, dry; fill. (GW)		145.80	Logged from cuttings, 0' to 5'.
5	5/5/5/4	100		<b>Sandy Gravel</b> : as above.		145	OVM battery dead.
	4/5/3/5	100		<b>Sandy Silt</b> : dark gray (N3), fine grained, soft, non-plastic, moist; hydrocarbon odor and hydrocarbon stain. (ML) <b>Sandy Silt</b> : as above; some clay, very fine. (ML)		140	Sample 6.5'-9', duplicate 06-SB-01-01 & 06-DS-02 MS/MSD. Headspace = 27 ppm. Headspace = 57 ppm.
10	1/1/2/3	100		<b>Sandy Silt</b> : dark gray (N3), fine grained, soft, non-plastic, moist; hydrocarbon stain. (ML) <b>Sand</b> : grayish brown (5YR 3/2), fine grained, poorly graded, sub-round, wet. (SP)		135	
				End of Borehole at 12' BGL.			

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	7.00	START DATE	7/15/92
GEOLOGIST	GJC	APPROVED BY	S.T. Godard
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	West Unit		

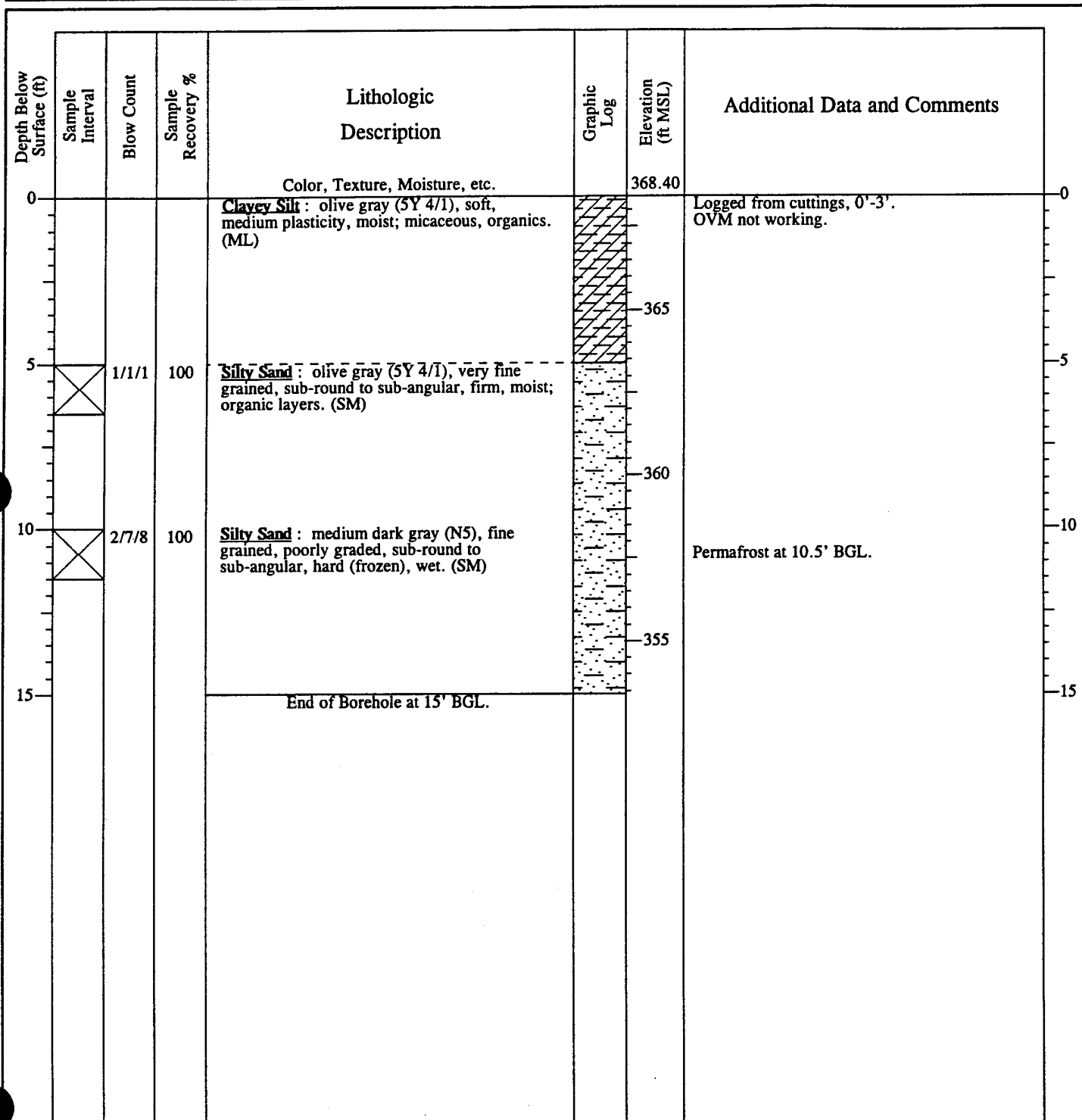
Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		142.10	
				<u>Gravelly Sand</u> : brownish gray (5YR 4/1), fine grained, poorly graded, sub-round, moist; fine grain gravel, minor silt. (SP)	o		Logged from cuttings, 0'-2'.
	4/2/3/2		100	<u>Sand</u> : olive gray (5Y 4/1), fine grained, poorly graded, sub-round, moist; trace fine gravel. (SP)	o	140	BH PID = 0.5 ppm, BZ PID = 0 ppm.
5	4/3/5/3			<u>Sandy Silt</u> : olive black (5Y 2/1), very fine, soft, non-plastic, moist; trace woodchips, minor iron staining. (ML)	o		Headspace = 0.5 ppm. BH & BZ PID = 0 ppm.
				End of Borehole at 7' BGL.			Headspace = 0 ppm.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	15.00	START DATE	8/11/92	FINISH DATE	8/11/92
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Campion				


**\*\*NOTES\*\***

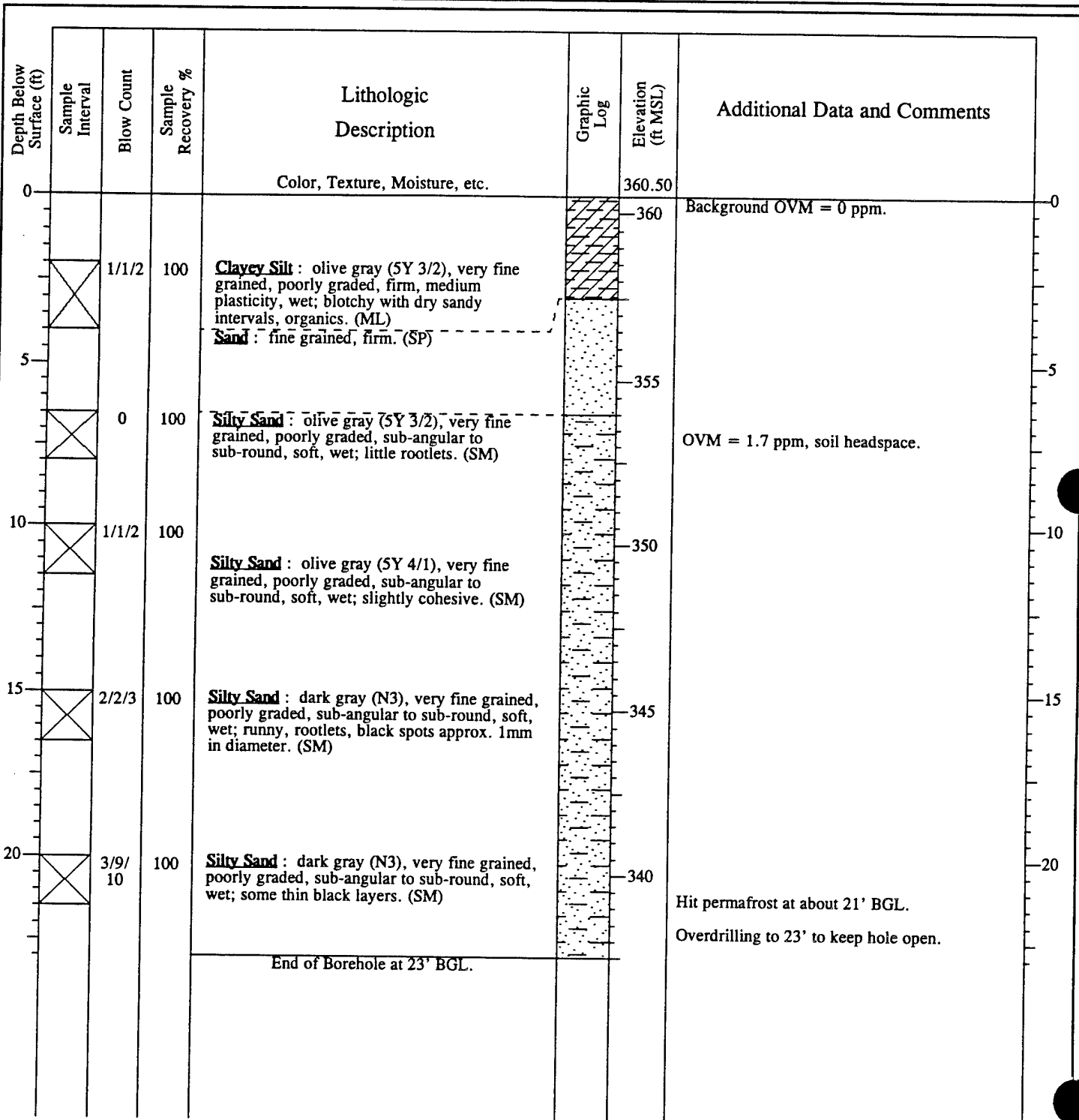
BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

 Monitor Well #: **07-MW-02**

 Page 1 of 1

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	23.00	START DATE	8/11/92	FINISH DATE	8/11/92
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Campion				

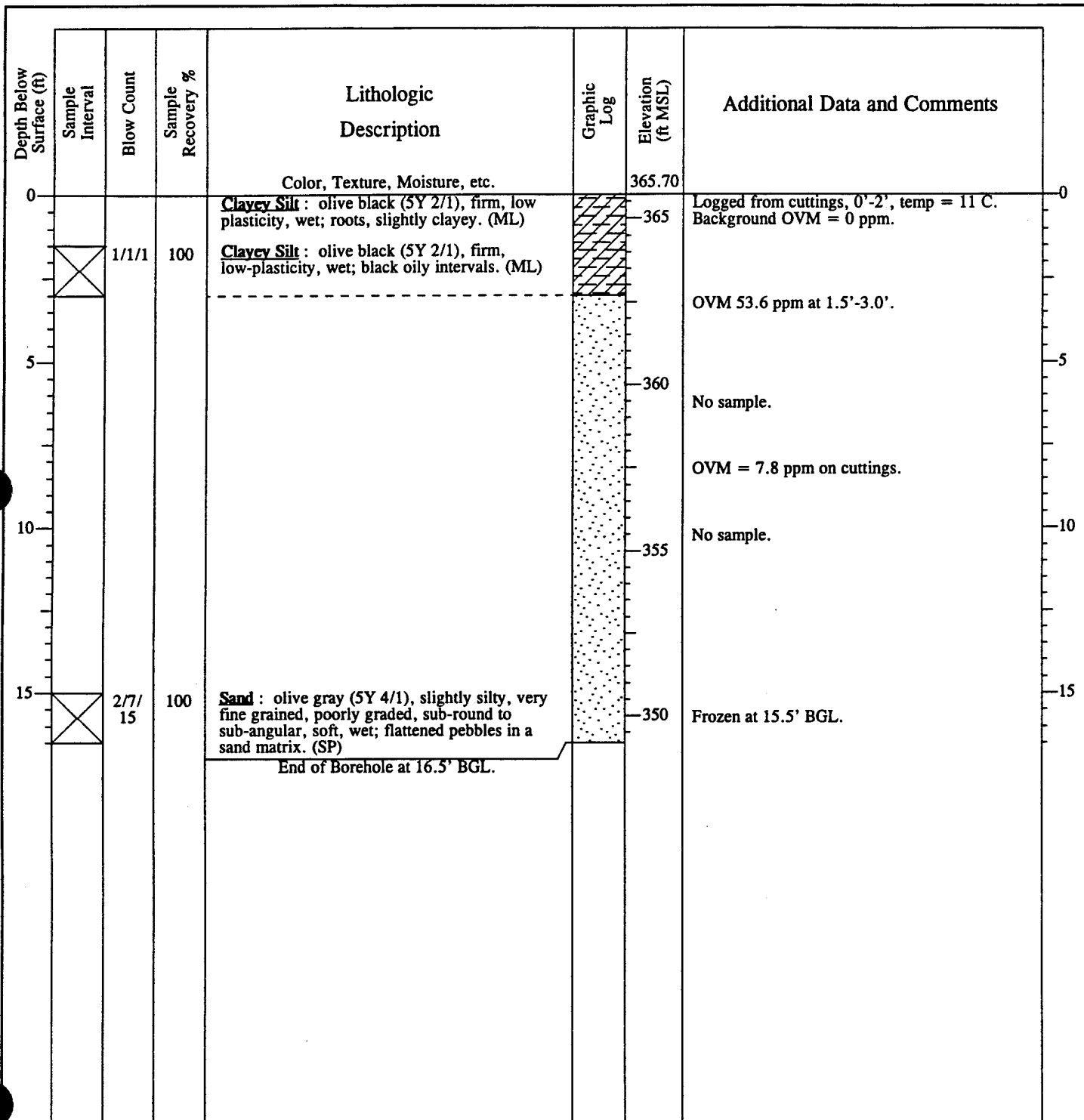

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million



**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	16.50	START DATE	8/10/92	FINISH DATE	8/10/92
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Campion				


**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	55.00	START DATE	8/9/92	FINISH DATE	8/9/92
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Campion				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		387.80	
				<u>Gravelly Silt</u> : light brownish-gray (5YR 4/1); 40% pebbles (loose). (ML)			Logged from cuttings, 0'-5'.
5	2/4/3	100		<u>Gravelly Sand</u> : pale yellow brown (10YR 6/2), very fine grained, poorly graded, sub-round to sub-angular, soft, moist; gravelly at top grading to well sorted sand, darker colored at 6.5'. (SP) <u>Sandy Silt</u> : olive gray		385 380	Temp = 17 C.
10	6/4/4	90		<u>Silty Sand</u> : light brownish gray (5Y 6/1), fine grained, well graded, sub-angular to sub-round, soft, moist; loose, gravelly. (SM) <u>Sandy Silt</u> : olive gray (5Y 3/2), very fine grained, poorly graded, sub-round, soft, moist; black intervals, flaky layers, lots of organics, woody plant remains, rootlets. (ML)		375	Temp = 14 C, OVM = 4.8 ppm. Strong burning rubber odor.
15	1/1/1	100		<u>Sandy Silt</u> : olive gray (5Y 3/2), very fine grained, poorly graded, sub-round, soft, moist. (ML) <u>Sand</u> : olive gray (5Y 3/2), very fine to fine grained, poorly graded, sub-round, soft, moist; some organics. (SP)		370	No water in hole after 3 mins. with E-line. Temp = 13 C.
20	2/3/4	100		<u>Silty Sand</u> : olive gray (5Y 3/2), very fine grained, poorly graded, round to sub-round, soft, wet; wet sample, micaceous flakes, small silty interval at top. (SM)		365	Temp = 8 C.
25	2/2/3	NR		<u>Clayey Silt</u> : olive gray (5Y 3/2). (ML)			Piece of clay in the end of spoon.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	X	2/6/8	NR			30	
35	X	1/1/1/9	100	<b>Sand</b> : olive gray to gray w/brown (5YR 3/2), very fine grained, poorly graded, sub-round, soft, wet; saturated, dripping, uniform "beach" sand. (SP)		35	Temp = 7 C, larger split spoon.
40	X	2/1/3		<b>Sand</b> : olive gray to grayish brown (5Y 3/2), fine grained, poorly graded, sub-round to round, soft, wet; saturated with water. (SP)		40	Temp = 3.5 C. Pushed 1.5' w/2'2" split spoon, approx. 4.5' heave into augers.
45	X	2/2/3		<b>Sand</b> : olive gray to grayish brown (5Y 3/2), fine grained, poorly graded, sub-round to round, soft, wet; saturated with water. (SP)		45	Temp = 3 C.
50						50	
55				End of Borehole at 55' BGL.		55	Drilled 1' through assumed permafrost layer.

**LOG OF DRILLING OPERATIONS**

 Soil Boring #: **07-SB-01**

 Page **1** of **1**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	5.00	START DATE	8/12/92	FINISH DATE	8/12/92
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Campion				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		365.40	
				<u>Gravelly Sand</u> : olive gray (5Y 4/1), fine grained, poorly graded, sub-angular, soft, moist; gravel and sand, organics and silt, rootlets. (SP)		365	Logged from cuttings, 0'-3'.
				<u>Silty Sand</u> : olive gray (5Y 4/1), fine grained, poorly graded, sub-angular to sub-round, soft, moist; mottled with medium gray (N5) and some organish-brown staining. (SM)			Sample 07-SB-01, OVM = 7.7 ppm off augers. Oderiferous at top (hydrocarbon).
5	1 1/2/ 1	100		End of Borehole at 5' BGL.			Saturated.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	5.00	START DATE	8/12/92	FINISH DATE	8/12/92
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Campion				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				<u>Not Defined</u> : lots of organics, some large pieces of wood. (OL)		365.10	Logged from cuttings, 0'-3'. Grass and plants at top.
5	1/1/1/1	1	100	<u>Silty Sand</u> : olive gray (5Y 4/1), fine grained, poorly graded, sub-angular to sub-round, moist; saturated to dripping point at bottom, some faint orangish brown mottling. (SM) End of Borehole at 5' BGL.			From sample 0.3 ppm, headspace = 0.3 ppm.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	55.00	START DATE	7/9/92
GEOLOGIST	GJC	APPROVED BY	S.T. Godard
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Million Gallon Hill		







Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0			75	Color, Texture, Moisture, etc.		140.40	
			75	<u>Sandy Gravel</u> : dark brown (10YR 3/3), fine grained, poorly graded, moist, sub-round to round, 1/4" to 3/4" gravel. (GP)		140	Headspace 0' - 2' = 5 ppm.
	2 3/4 / 3		75	<u>Gravelly Sand</u> : dark brown (10YR 3/3), medium to coarse grained, well graded, sub-round, moist. (SW)			Sample (2' - 3') 09-MW-01-02. BH & BZ PID = 0 ppm, Headspace 2' - 4' = 7 ppm. BH and BZ PID = 0 ppm. 1.5' Sampler from 4.5' - 40.0' BGL at 5' intervals. Water @ 5.2' BGL.
5			100	<u>Sandy Silt</u> : dark grayish brown (2.5Y 4/2), soft, non-plastic, moist, wood fragments from 4' - 4.5'. (ML)		135	
				<u>Gravelly Sand</u> : dark grayish brown (2.5Y 4/2), medium to coarse grained, well graded, sub-round to round, wet. (SW)			
10		1 3/6	100	<u>Sand</u> : grayish brown (2.5Y 5/2), medium to coarse grained, sub-round, wet. (SW)		130	BH and BZ PID = 0 ppm.
15		1 3/5	100	<u>Sand</u> : as above.		125	BH and BZ PID = 0 ppm.
20		2 3/4	100	<u>Sand</u> : grayish brown (2.5Y 5/2), medium to coarse grained, well graded, trace of fine gravel, wood fragments from 21.3' - 21.5. (SW)		120	BH and BZ PID = 0 ppm. At 20', 3' of heave, pull auger, remove heave.
25		5 3/3	66.6	<u>Gravel</u> : fine to coarse grained, well graded, round, wet, 1/4" - 1" gravel. (GW)		115	BH and BZ PID = 0 ppm.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

 PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	X	4/3/3	100	<u>Sand</u> : grayish brown (2.5Y 5/2), coarse to very coarse grained, poorly graded, round, wet, trace 1/8" gravel. (SP) <u>Gravel</u> : fine grained, poorly graded, round, wet, 1/8" - 1/4" gravel. (GP)		110	BH and BZ PID = 0 ppm. At 30', 7' of heave, pull up to 25' and remove heave.
35	X	4/3/2	NR	<u>No Sample</u>		105	BH and BZ PID = 0 ppm.
40	X	8/5/4	100	<u>Sand</u> : grayish brown (2.5Y 5/2), medium to coarse grained, well graded, sub-round, wet, grades to fine gravel. (SW) <u>Gravel</u> : poorly graded, round, wet, 1/4" - 1/2" gravel. (GP)		100	BH PID = 2.3 ppm, BZ PID = 0 ppm. Continued drilling to 55'.
45						95	
50						90	
55				End of Borehole at 55' BGL.			

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	50.00	START DATE	7/9/92	FINISH DATE	7/9/92
GEOLOGIST	GJC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Million Gallon Hill				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		141.00	
				<u>Gravelly Sand</u> : very dark gray (10YR 3/1), fine to medium grained, well graded, sub-round, moist, surface topsoil. (SW)		140	PID background = 0 ppm.
5	3/4/5/5		100	<u>Silty Sand</u> : dark grayish brown (2.5Y 4/2), fine grained, poorly graded, sub-round, moist, fines; abundant 1/4" - 1/2" gravel. (SM) <u>Sandy Silt</u> : dark grayish brown (2.5Y 4/2), soft, non-plastic, moist, fines; wood chips; from 4' - 4.1' sparse iron staining. (ML)		135	Sample (2.5' to 4.5') 09-MW-02-02. Headspace 2.5' - 4.5' = 3 ppm, BH & BZ PID = 0 ppm.
10	push		100	<u>Gravelly Sand</u> : dark gray (10YR 4/1), medium to coarse grained, poorly graded, sub-round, wet, trace 3/8" gravel throughout, minor fine grain sand, predominantly medium. (SP)		130	1.5" Split spoon from 10' to 41.5'.
15	2/2/2		100	<u>Gravelly Sand</u> : as above, 1/4" - 3/8" gravel from 15' to 15.3', predominantly medium. (SP)		125	BH & BZ PID = 0 ppm.
20	1/2/3		100	<u>Sand</u> : grayish brown (2.5Y 5/2), medium to coarse grained, poorly graded, sub-round to round, wet, predominantly medium, coarsening downward. (SP) <u>Sandy Gravel</u> : fine grained, poor grading, sub-round to round, wet. (GP)		120	BH & BZ PID = 0 ppm, core temp = 10 C.
25	1/3/3		100	<u>Sandy Gravel</u> : fine grained, poorly graded, round, wet, 1/8" - 3/8", occasional 1" gravel. (GP)		115	BH & BZ PID = 0 ppm.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million



**LOG OF DRILLING OPERATIONS**

 PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	X	5/4/3	NR	<b>No Sample</b>		110	Sample washed out, at 30' heaved to 27'.
35	X	4/7/8	100	<b>Sandy Gravel</b> : fine grained, well graded, round, wet, 1/8" - 3/8" gravel, minor 3/4" gravel. (GW)		105	BH & BZ PID = 0 ppm.
40	X	12/14/9	100	<b>Sand</b> : dark gray (10YR 5/1), medium to coarse grained, poorly graded, sub-round to round, wet, minor medium, pedominantly coarse, trace fine gravel. (SP)		100	BH & BZ PID = 0 ppm.
45						95	
50				End of Borehole at 50' BGL.		50	

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	50.00	START DATE	8/15/92	FINISH DATE	8/15/92
GEOLOGIST	R. Petrossian	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Million Gallon Hill				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0						141.50	Spudding hole.
2 1/2	2/2/2	70		<b>Silty Sand</b> : dark yellow brown (10YR 4/2), fine grained, poorly graded, sub-round to sub-angular, very soft, slightly moist, pebbles, rotten rootlets, few pieces of wood. (SM)		140	OVM = 0 ppm.
10	1/1/2	70		<b>Sand</b> : dark yellow brown (10YR 4/2), minor silty, fine grained, poorly graded, sub-angular to sub-round, very soft, moist, few rootlets. (SP)		130	Starting to hit water. Water level at 10.5' BGL.
15	5/5/4	90		<b>Gravelly Sand</b> : dark yellow brown (10YR 4/2), medium grained, poorly graded, very soft, very moist, 20 % pebbles. (SP)		125	
20	10/11/7	100		<b>Gravelly Sand</b> : dark yellow brown (10YR 5/2), fine grained, poorly graded, sub-angular to sub-round, very soft, wet, gravelly at bottom. (SP)		120	2.5' Heave in augers.
25	21/27/16	100		<b>Sand</b> : dark yellow brown (10YR 6/2), coarse grained, well graded, sub-round to round, very soft, wet, 40% gravel. (SW)		115	4.5' Heave in augers.

**\*\*NOTES\*\***





BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

**LOG OF DRILLING OPERATIONS**

 PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	12/18/9	100	100	<u>Sandy Gravel</u> : dark yellow brown (10YR 6/2), coarse grained, poorly graded, sub-round to round, very soft, wet, less gravelly. (GP)		110	Took sieve sample.
35	12/22/17	100	100	<u>Sandy Gravel</u> : dark gray (5GY 4/1), fine grained, poorly graded, sub-round, wet, color change. (GP)		105	
40	18/14/7	100	100	<u>Gravelly Sand</u> : dark gray (5GY 4/1), coarse grained, well graded, sub-round to round, very soft, wet, more felsic, < 20% gravel. (SW)		100	
45	19/13/7	100	100	<u>Sand</u> : dark gray (5GY 4/1), coarse grained, poorly graded, sub-round, very soft, wet, not as gravelly, few small pebbles. (SP)		95	
50				End of Borehole at 50' BGL.			

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	56.00	START DATE	7/7/92
GEOLOGIST	T. A. Council	APPROVED BY	S.T. Godard
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Million Gallon Hill		

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		143.20	
2/18/17/16	50			<b>Sandy Gravel</b> : fine grained, poorly graded, sub-round, moist. (GP)		140	BH & BZ PID = 0 ppm.
1/1/1/1	100			<b>Sandy Silt</b> : dark grayish brown (2.5Y 4/2), fine grained, soft, non-plastic, moist, woodchips from 3' to 3.5'. (ML)			BH & BZ PID = 0 ppm. Water at 5.02' BGL, on 8 July 1992.
				<b>Silt</b> : olive brown (2.5Y 4/4), soft, non-plastic, moist to wet, woodchips from 5' to 5.3'. (ML)			
				<b>Silty Sand</b> : medium grained, poorly graded, wet, logged from cuttings. (SM)		135	Shut down for the day, restarted at 0715, 08 July 92.
1/1/2/3	90			<b>Silty Sand</b> : dusky yellow brown (10YR 2/2), fine to medium grained, poorly graded, round, soft, wet, woodchips from 10' to 10.4'. (SM)			BH & BZ PID = 0 ppm, sieve sample collected.
				<b>Sand</b> : dusky yellow brown (10YR 2/2), medium grained, poorly graded, round, soft, wet, sand and minor silt layers. (SP)		130	
1/2/3/4	70			<b>Sand</b> : olive black (5Y 2/1), medium grained, well graded, round, soft, wet, lots of wood. (SW)			
				<b>Gravelly Sand</b> : olive black (5Y 2/1), medium to coarse grained, well graded, round, wet, gravel fine, well rounded, MaFics 15% to 20%. (SW)		125	SS stuck in hole, pulled augers to retrieve, 0815 augers out of hole, sieve sample collected.
1/1/1	100			<b>Sand to Gravelly Sand</b> : olive black (5Y 2/1), medium to coarse grained, well graded, round, soft, wet, fining up. (SW)		120	18" 1.5" I.D. sampler, top 6" could be heaved sand.
2/5	87			<b>Gravelly Sand</b> : olive black (5Y 2/1), medium to coarse grained, well graded, round, very soft, wet, bottom 0.3' of Split Spoon is gravel unit, may have interbedded gravel and sand. (SW)			1.6' Heave up inside augers, lifted augers 6", rod fell to TD. Drove 12", top 1' of 1.3' SS heaved sands, BH PID = 0.6 ppm, BZ PID = 0.6 ppm

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT		Galena Stage 3 RI/FS		LOCATION		Galena AFS Area, Alaska	
Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	2/3	100		<u>Sand</u> : olive black (5Y 2/1), medium grained, poorly graded, round, very soft, wet, wood at 30.6'. (SP) <u>Gravelly Sand</u> : olive black (5Y 2/1), coarse grained, well graded, round, wet, distinct gravel unit at bottom of split spoon. (SW)		30 110	Drove SS 12", top 0.8' of recovery may be heaved sands, wood in ^C cuttings, drilling through old trees. BH PID = 0.6 ppm, BZ PID = 0.6 ppm.
35	4/8	100		<u>Gravelly Sand</u> : olive black (5Y 2/1), medium to coarse grained, well graded, round, soft, wet, 0.3' thick, coarse sand and gravelly layers, fine gravel at bottom of split spoon, pebbles up to 0.75". (SW)		105	Sands still heaving when sampling/removing rods.
40	7/19	100		<u>Gravelly Sand</u> : olive black (5Y 2/1), medium to coarse grained, well graded, round, very soft, wet, gravel layer at 40.4', lots of wood. (SW)		100	Cuttings are not cold, 10 C, sample may be mostly heaved sands.
45	9/14	40		<u>Gravelly Sand</u> : as above, no wood in split spoon.		95	Through the woody layer.
50	6/11	100		<u>Sandy Gravel</u> : fine grained, well graded, round, wet, "reducing" odor. (SW)  <u>Sand</u> : olive black (5Y 2/1), medium grained, poorly graded, round, very soft, wet, woodchips medium to fine samples. (SP)		90	6' Heave inside augers, raised augers 1' and rod with sampler. Dropped to 50' BGL.
55	9/12	70		End of Borehole at 56' BGL.			BH PID = 0.6 ppm, BZ PID = 0.6 ppm.

PROJECT	<u>Galena Stage 3 RI/FS</u>	LOCATION	<u>Galena AFS Area, Alaska</u>
TOTAL DEPTH	<u>50.00</u>	START DATE	<u>8/16/92</u>
GEOLOGIST	<u>R. Petrossian</u>	APPROVED BY	<u>S.T. Godard</u>
DRILLING COMPANY	<u>Hughes Drilling</u>	DRILLER	<u>R. Erickson, R. Ish</u>
DRILLING METHOD	<u>Grab/Split Spoon</u>	EQUIPMENT	<u>CME 75 Nodwell TrkRg</u>
DRILL BIT TYPE AND SIZE	<u>Hollow Stem Auger - 4 1/4" ID</u>		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	<u>Million Gallon Hill</u>		

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0						139.00	
2 1/2	2/1/2	100		<b>Sandy Silt</b> : brownish gray (5YR 4/1), fine grained, poorly graded, very soft, non-plastic, moist; sandy intervals, 1mm thick, organic roots, micaceous. (ML)		135	Headspace OVM = 0 ppm.
10	1/1/2	50		<b>Silty Sand</b> : dark yellow brown (10YR 4/2), fine grained, poorly graded, sub-round to sub angular, very soft, wet; some pebbles (15%) in matrix, rather smooth and rounded. (SM)		130	Water at 8'2" BGL.
15	3/6/11	85		<b>Gravelly Sand</b> : dark yellow brown (10YR 4/2), fine grained, poorly graded, sub-round to sub-angular, very soft, wet; interval of pebbles at bottom 4" thick, alot of quartz pebbles up to 1/2" in diameter. (SP)		125	Headspace OVM = 0 ppm.
20	1/1/1	80		<b>Gravelly Sand</b> : dark yellow brown (10YR 4/2), fine grained, poorly graded, sub-angular to sub-rounded, very soft, wet; woodchips, probably slough, micaceous. (SP)		120	
25	2/2/6	100		<b>Gravelly Sand</b> : light olive gray (5Y 6/1), fine grained, poorly graded, sub-round to sub-angular, very soft, non-plastic, wet; very gravelly, not much sand, at bottom for about 3" 50% quartz. (SP)		115	

**\*\*NOTES\*\***




BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

**LOG OF DRILLING OPERATIONS**

 PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	5/16/13	100	100	<u>Gravelly Sand</u> : dark yellow brown (10YR 4/2), fine grained, poorly graded, sub-round to sub-angular, very soft, wet; color change, 3" gravel at bottom, coarser than before. (SP)		110 30	
35	10/23/10	100	100	<u>Sand</u> : light olive gray (5Y 6/1), fine grained, poorly graded, sub-round, very soft, wet; coarser grained and color change. (SP)		105 35	
40	9/14/8	100	100	<u>Gravelly Sand</u> : light olive gray (5Y 6/1), fine grained, well graded, sub-round, very soft, wet; coarsening downward, 50% quartz, 30% mafic. (SW)		100 40	Approximately 4' heave in augers.
45						95 45	
50				End of Borehole at 50' BGL.		90 50	

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	50.00	START DATE	8/17/92
GEOLOGIST	P. A. Coplen	APPROVED BY	S.T. Godard
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Million Gallon Hill		

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0						137.90	BZ PID = 0 ppm.
5	2/2/2/3	100		<b>Silt</b> : olive gray (5Y 4/1), soft, medium plasticity, moist; few gravel <30mm, many rootlets and woodchips. (ML)		135	BH PID = 0 ppm, collected normal and dupe.
	2/2/2/2	100		<b>Sand</b> : olive gray (5Y 3/2), fine to medium grained, poorly graded, round, moist. (SP) <b>Gravelly Sand</b> : olive gray (5Y 3/2), fine to coarse grained, well graded, round to sub-round, wet. (SW)		130	BH PID = 0 ppm. Water at 6.1' BGL.
10	2/2/3	60		<b>Gravelly Sand</b> : olive gray (5Y 3/2), medium to coarse grained, well graded, round, wet. (SW) <b>Silt</b> : soft, medium plasticity; rootlets/organic debris in silt. (ML)		125	BH & BZ PID = 0 ppm, left augers open to check water level.
15	2/2/5			<b>Sand</b> : olive gray (5Y 3/2), fine grained, well graded, round, wet; some gravel <1%, 4" of medium to coarse grained sand at 15.8' to 16'. (SW)		120	BH PID = 0 ppm, temp = 4 C.
20	7/33	100		<b>Sand</b> : olive gray (5Y 3/2), medium to coarse grained, well graded, round, wet; sand coarsens with depth, some gravel. (SW)		115	Cuttings = 0.0.
25				<b>Sand</b> : olive gray (5Y 3/2), medium to coarse grained, well graded, round to sub-round, wet; few gravel <5%. (SW)			BH & BZ PID = 0 ppm, 6" heave in augers, stopped hammer after ^C second 6", 5' of heave when hole re-entered with bit.  6' Heave when re-entered with bit, collected sieve sample.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

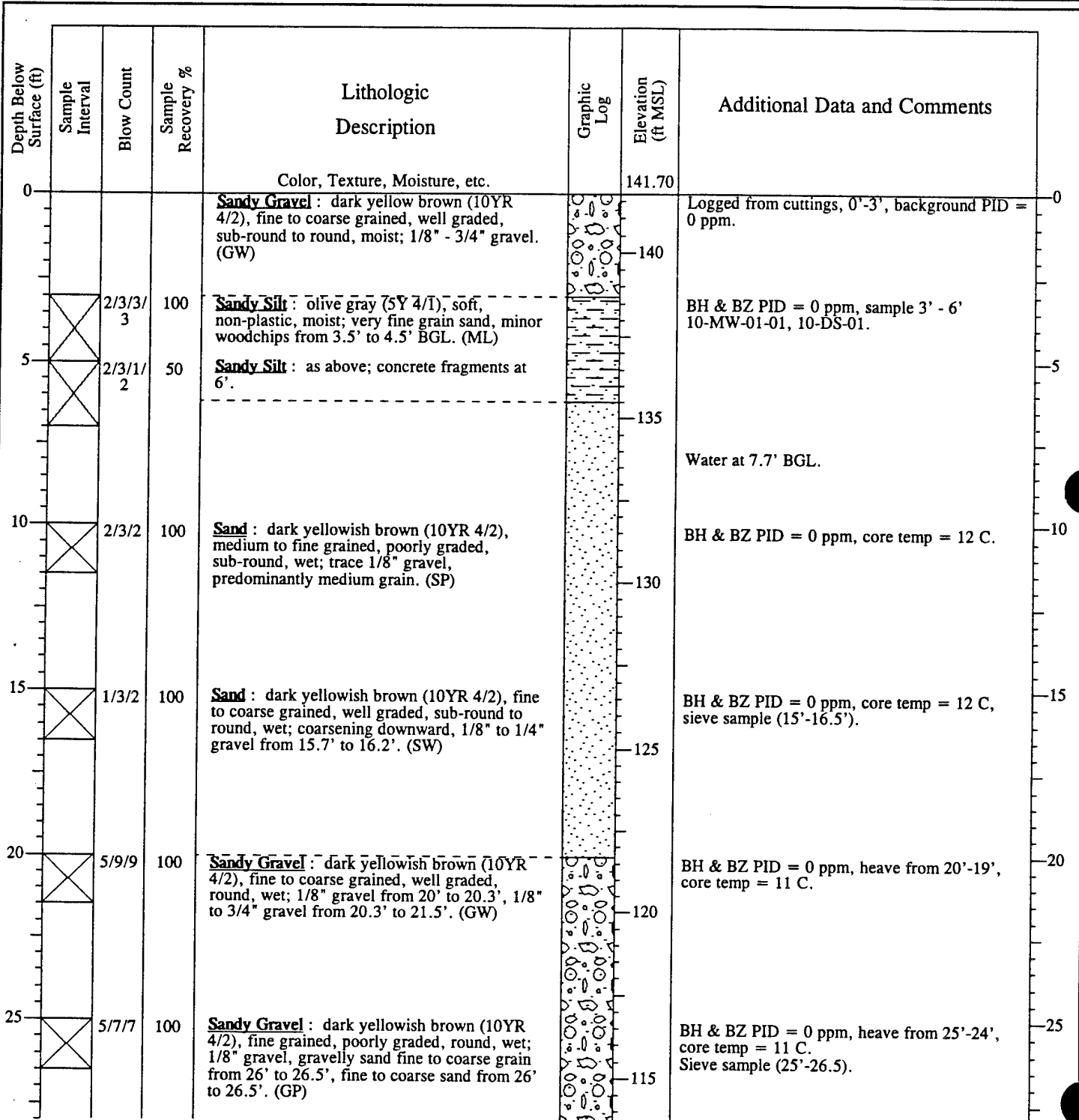


PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30							8' Heave, could not get sample.
35	11/19/12	100		<b>Sand</b> : olive gray (5Y 3/2), fine to medium grained, well graded, round, wet; few gravel <1%. (SW)			4' Heave when bit re-entered.
40							
45	16/29/32	100		<b>Sand</b> : medium dark gray (N4), medium-coarse to fine-coarse grained; medium to coarse grain sand grades to finer grain sand with gravel. (SW)			11.5' Heave when bit re-entered, collected sieve sample.
50				End of Borehole at 50' BGL.			

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	50.00	START DATE	7/13/92
GEOLOGIST	GJC	FINISH DATE	7/13/92
APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Vehicle Maintenance Building		






**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT		Galena Stage 3 RI/FS		LOCATION		Galena AFS Area, Alaska	
Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	X	3/5/6	100	<b>Sandy Gravel</b> : dark yellowish brown (10YR 4/2), fine to coarse grained, well graded, round, wet; 1/8" to 3/4" gravel coarsening downward, minor 3/4" gravel, sand medium to coarse from 30' to 30.5'. (GW)		110	BH & BZ PID = 0 ppm, heave from 30'-28.5', core temp = 11 C.
35	X	2/3/4	100	<b>Sandy Gravel</b> : olive gray (5Y 4/1), fine grained, poorly graded, round, wet; predominantly 1/8" to 1/4" gravel, minor 3/4" gravel. (GP)		105	BH & BZ PID = 0 ppm, core temp = 11 C.
40	X	4/7/5	100	<b>Sandy Gravel</b> : olive gray (5Y 4/1), coarse to fine grained, well graded, round to sub-round, wet; 3/4" to 1/8" fencing downward. (GW) <b>Sand</b> : olive gray (5Y 4/1), medium to coarse grained, well graded, sub-round, wet; trace fine gravel, minor fine grain sand. (SW)		100	BH & BZ PID = 0 ppm, heave from 40'-38.5'. Heave from 41.5'-35', pull auger to 39' to drop out heave.
45						95	
50				End of Borehole at 50' BGL.			

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	50.00	START DATE	7/12/92	FINISH DATE	7/12/92
GEOLOGIST	GJC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Vehicle Maintenance Building				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		142.40	
				<b>Gravelly Sand</b> : dark grayish brown (10YR 4/2), fine to medium grained, well graded, sub-round, moist; surface topsoil, 1/4" to 3/4" gravel. (SW)			Logged from cuttings, 0 to 4'.
5				<b>Sandy Silt</b> : very dark gray (10YR 3/1), fine grained, soft, non-plastic, moist; hydrocarbon odor, trace gray discoloration. (ML)			BH PID = 1.5 ppm, BZ PID = 0 ppm. Sample (4'-5.5') 10-MW-02-02, headspace from 4'-5.5' = 432 ppm.
10	2/4/6	100		<b>Sand</b> : dark gray (10YR 4/1), medium to fine grained, poorly graded, sub-round, wet; slight hydrocarbon odor. (SP)			BH PID = 17.8 ppm, BZ PID = 0 ppm, sieve sample (10'-11.5').
15	2/5/7	100		<b>Gravelly Sand</b> : dark gray (10YR 4/1), medium to coarse grained, well graded, sub-round to round, wet; common 1/8" to 1/4" gravel throughout, slight hydrocarbon odor. (SW)			BH PID = 78 ppm, BZ PID = 0 ppm, core temp = 12 C.
20	12/22/24	100		<b>Gravelly Sand</b> : dark gray (10YR 4/1), fine to coarse grained, well graded, round, wet; fine gravel to 3/4". (SW)			BH PID = 14 ppm, BZ PID = 0 ppm, core temp = 12 C. Heave from 20'-19'.
25	25/36/25	100		<b>Gravelly Sand</b> : dark gray (10YR 4/1), fine to coarse grained, well graded, round, wet; fine gravel to 3/4". (SW)			BH PID = 8 ppm, BZ PID = 0 ppm, core temp = 12 C. Heave from 25'-26', sieve sample (25'-26.5').

**\*\*NOTES\*\***




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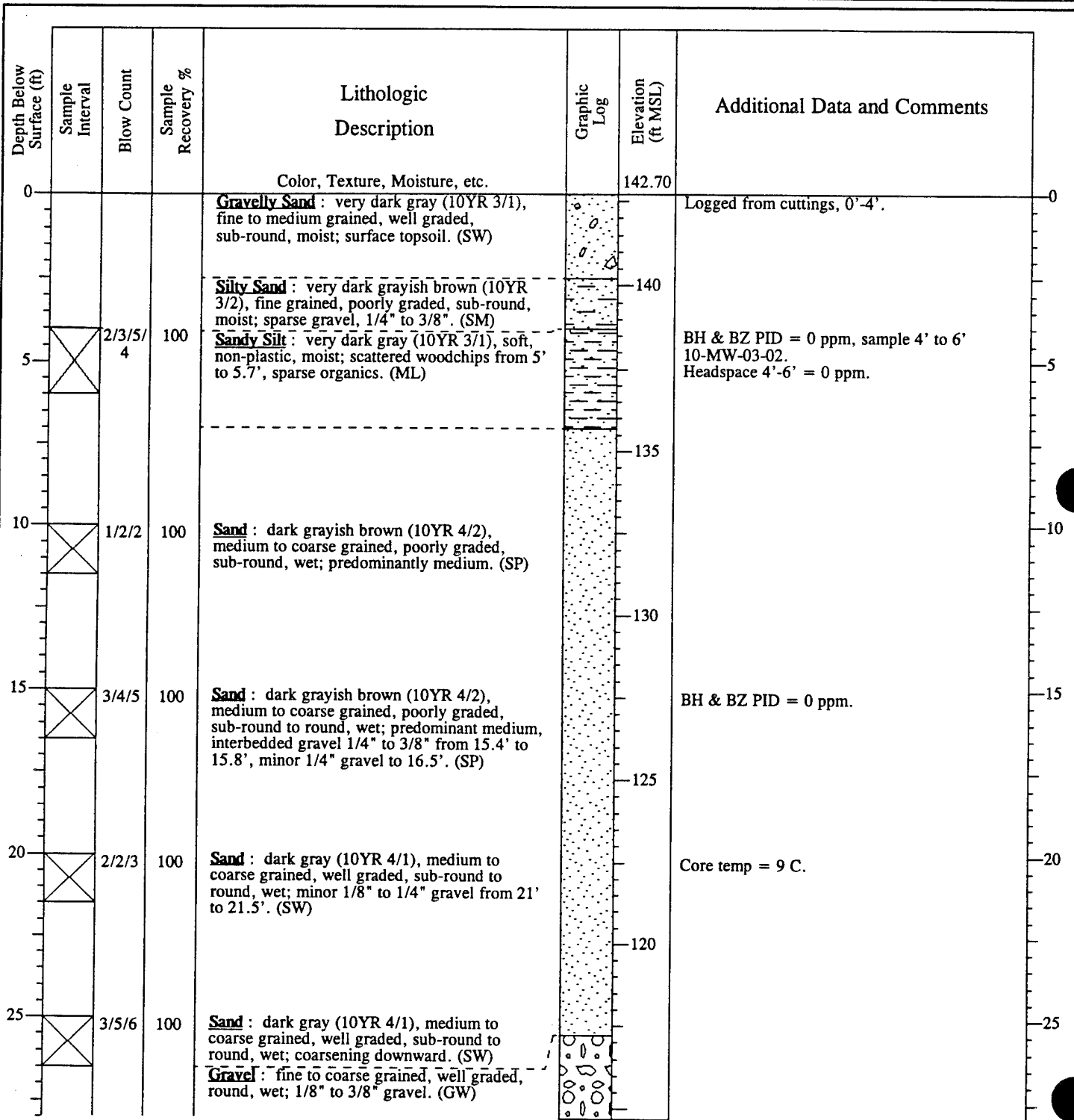
## LOG OF DRILLING OPERATIONS

PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	X		100	<u>Gravelly Sand</u> : dark gray (10YR 4/1), fine to coarse grained, well graded, round, wet; fine gravel to 3/4". (SW)		30	BZ PID = 0 ppm, core temp = 12 C. Heave from 30'-29'.
35	X		100	<u>Gravelly Sand</u> : dark gray (10YR 4/1), fine to coarse grained, well graded, round, wet; fine gravel. (SW)		35	BZ PID = 0 ppm, core temp = 12 C. Heave from 35'-34'.
40	X	11/11/ 12	100	<u>Gravelly Sand</u> : dark gray (10YR 4/1), fine to coarse grained, well graded, round, wet. (SW)		40	BH PID = 6.2 ppm, BZ PID = 0 ppm. Heave from 40'-38'.  No samples from 41.5' to 50'.
45						45	
50				End of Borehole at 50' BGL.		50	

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	50.00	START DATE	7/11/92	FINISH DATE	7/11/92
GEOLOGIST	GJC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Vehicle Maintenance Building				

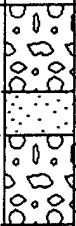



**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT		Galena Stage 3 RI/FS		LOCATION		Galena AFS Area, Alaska	
Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30	X	2/5/6	100	<u>Sand</u> : dark gray (10YR 4/1), medium to coarse grained, well graded, sub-round to round, wet; coarsening downward. (SW) <u>Gravel</u> : fine to coarse grained, well graded, round, wet; 1/8" to 3/8" gravel. (GW)		30 110	
35	X	2/2/5	100	<u>Sand</u> : dark gray (10YR 4/1), fine to medium grained, poorly graded, sub-round, wet. (SP)		35 105	Core temp = 9 C.
40	X	3/6/5	100	<u>Sand</u> : dark gray (10YR 4/1), fine to coarse grained, well graded, sub-round, wet; 1/8" to 1/4" gravel from 41.2' to 41.5'. (SW)		40 100 95	BH & BZ PID = 0 ppm, core temp = 8 C.  No split spoon sample from 41.5' to 50'.
45							
50				End of Borehole at 50' BGL.			

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	7.00	START DATE	7/15/92
FINISH DATE	7/15/92		
GEOLOGIST	GJC	APPROVED BY	S.T. Godard
R.G.#	275 - Alaska		
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Vehicle Maintenance Building		

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		142.30	
				<b>Gravelly Sand</b> : olive gray (5Y 4/1), fine grained, poorly graded, sub-round, moist; fine grains sand, silty. (SP)			Logged from cuttings from 0'-2'.
	5/7/15/12		100	<b>Gravelly Sand</b> : olive gray (5Y 4/1), fine grained, poorly graded, sub-round, moist; decrease gravel with depth. (SP)		140	Sample 2'-4', 10-SB-01-01. Headspace = 0 ppm. BH PID = 0.5 ppm, BZ PID = 0 ppm.
5	2/3/3/2		100	<b>Sandy Silt</b> : olive black (5Y 2/1), very fine grained, soft, non-plastic, moist; very fine grain sand, sparse iron staining. (ML)			Sample 5'-7', 10-SB-01-02. Headspace = 0 ppm. BH & BZ PID = 0 ppm.
				End of Borehole at 7' BGL.			

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million



PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	6.00	START DATE	7/13/92	FINISH DATE	7/13/92
GEOLOGIST	GJC	APPROVED BY	S.T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	Hughes Drilling		DRILLER	R. Erickson, R. Ish	
DRILLING METHOD	Grab/Split Spoon		EQUIPMENT	CME 75 Nodwell TrkRg	
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Vehicle Maintenance Building				

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0						141.50	
	1/1/1/1	1	100	<b>Silty Sand</b> : olive gray (5Y 4/1), fine grained, poorly, sub-round, moist; gravelly 1/4" to 3/4", minor > 1". (SM)		140	Logged from cuttings 0'-1'. Sample 1'-3', 10-SB-02-01. Headspace = 660 ppm.
	1/2/5/1	8	100	<b>Sandy Silt</b> : olive black (5Y 2/1), very fine grained, soft, non-plastic, moist; woodchips at 2.5' to 2.7', sparse iron staining. (ML) <b>Sandy Silt</b> : olive black (5Y 2/1), very fine grained, soft, non-plastic, moist; discolored hydrocarbon odor. (ML)			BH PID = 101 ppm, BZ PPM = 2 ppm. Sample 4'-6', 10-SB-02-02. Headspace = 158 ppm.
5				End of Borehole at 6' BGL.			Approx. water depth at 6' BGL.

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM

BGL = Below Ground Level, NR = No Recovery

ppm = parts per million

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	9.00	START DATE	7/11/92
GEOLOGIST	GJC	APPROVED BY	S.T. Godard
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Vehicle Maintenance Building		

Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		141.60	
1	1/1/1	1	75	<b>Gravelly Sand</b> : dark grayish brown (10YR 4/2), fine to medium grained, well graded, sub-round, moist; surface topsoil, 1/4" - 3/4" gravel. (SW)		140	Sample 1'-2.5', 10-SB-03-01. BH & BZ PID = 0 ppm.
2	2/2/2	2	75	<b>Silty Sand</b> : dark grayish brown (10YR 4/2), fine grained, poorly graded, sub-round, moist. (SM)			Hydrocarbon odor from 4'-5.5'. Sample 4'-5.5', 10-SB-03-02. BH PID = 1.7 ppm, BZ PID = 0 ppm. Headspace = 4.7 ppm.
3	2/1/3	2	90	<b>Sandy Silt</b> : very dark gray (10YR 3/1), fine grained, soft, non-plastic, moist; trace woodchips, abundant organics, sparse iron staining. (ML)		135	Approx. water level 6.5' BGL. Sample 7'-8.5', 10-SB-03-03.
				<b>Sandy Silt</b> : very dark gray (10YR 3/1), fine grained, soft, non-plastic, moist; hydrocarbon odor. (ML)			
				<b>Silty Sand</b> : dark yellowish brown (10YR 4/4), fine grained, poorly graded, sub-round, wet; minor thin gray discolored bands, trace iron staining, interbedded fine grain sand from 7.8' to 8.2'. (SM)			Headspace = 85 ppm.
				End of Borehole at 9' BGL.			

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	8.00	START DATE	7/16/92
GEOLOGIST	KLC	APPROVED BY	S.T. Godard
DRILLING COMPANY	Hughes Drilling	DRILLER	R. Erickson, R. Ish
DRILLING METHOD	Grab/Split Spoon	EQUIPMENT	CME 75 Nodwell TrkRg
DRILL BIT TYPE AND SIZE	Hollow Stem Auger - 4 1/4" ID		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Underground Storage Tank		

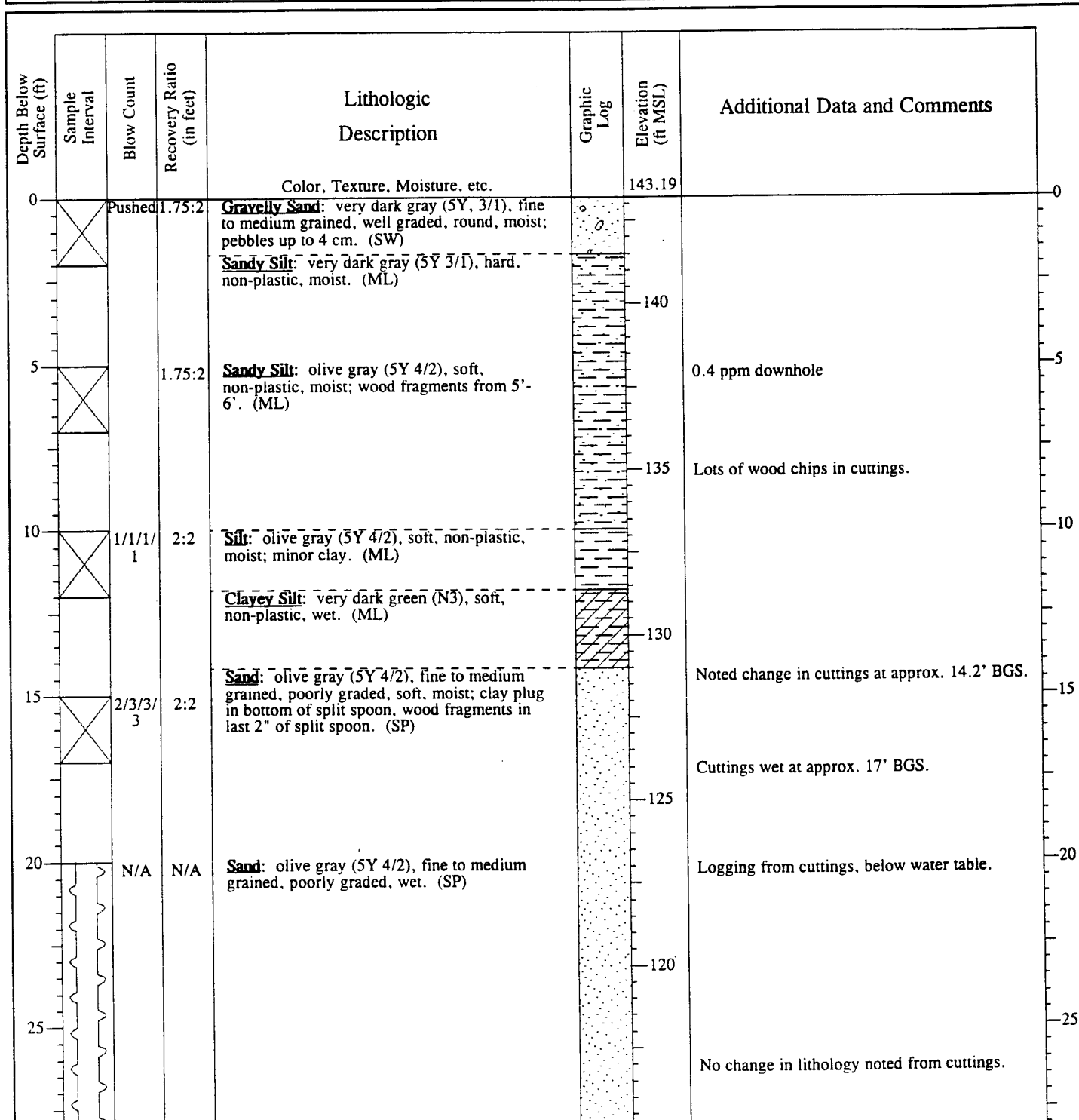
Depth Below Surface (ft)	Sample Interval	Blow Count	Sample Recovery %	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		139.90	
				<u>Sandy Silt</u> : dark yellowish brown (10YR 4/2), very fine grained, soft, non-plastic, moist; roots. (ML)			Logged from cuttings 0' to 2'.
				<u>Sandy Silt</u> : grayish brown (5YR 3/2), very fine grained, soft, non-plastic, moist; minor clay, roots, woodchips, organics. (ML)			BH & BZ PID = 0 ppm.
							Headspace = 0 ppm.
5				<u>Sandy Silt</u> : dark yellowish brown (10YR 4/2), very fine grained, soft, non-plastic, moist. (ML)		135	BH PID = 3 ppm, BZ PID = 0 ppm.
							Headspace = 0 ppm.
				End of Borehole at 8' BGL.			

**\*\*NOTES\*\***

BH PID = Borehole OVM, BZ PID = Breathing Zone OVM  
 BGL = Below Ground Level, NR = No Recovery  
 ppm = parts per million

**1993 Drilling Logs**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	50.00	START DATE	8/6/93 08:30	FINISH DATE	8/6/93 11:00
GEOLOGIST	T. A. Council	APPROVED BY	S. T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Fire Training Area				

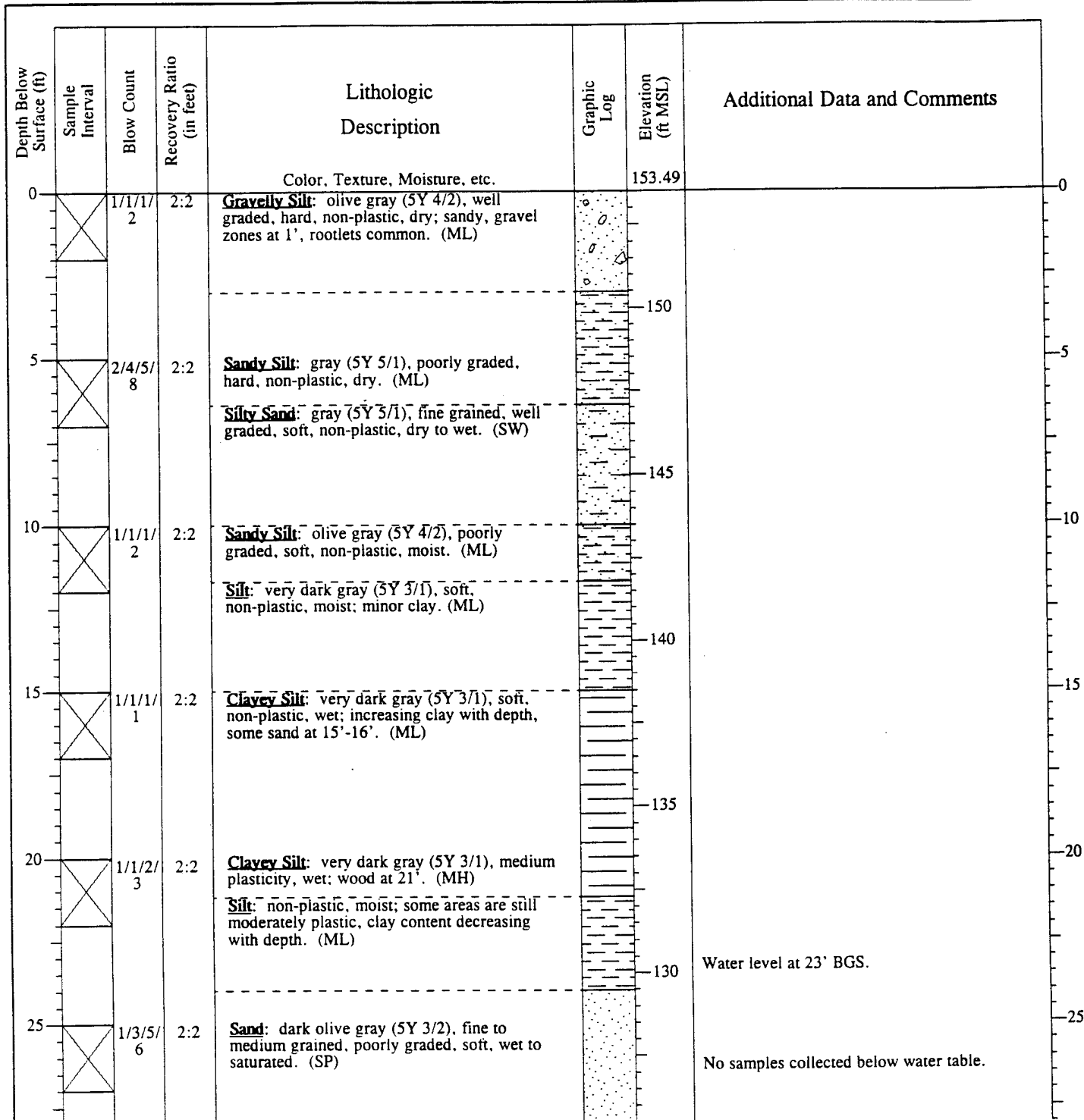

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT <u>Galena Stage 3 RI/FS</u>		LOCATION <u>Galena AFS Area, Alaska</u>					
Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30						110	
35						105	
40						100	
45						95	
50							Total Depth = 50' BGS.

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	45.00	START DATE	7/8/93 08:30	FINISH DATE	7/8/93 11:00
GEOLOGIST	T. A. Council	APPROVED BY	S. T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Fire Training Area				


**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT		Galena Stage 3 RI/FS		LOCATION		Galena AFS Area, Alaska	
Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30		N/A	N/A	<u>Clayey Silt</u> : dark olive gray (5Y 3/2), low plasticity, wet. (ML)		125	
35				<u>Clayey Sand</u> : dark olive gray (5Y 3/2), fine to medium grained, poorly graded, wet. (SP)		120	
40						115	
45						110	Total Depth at 45' BGS.



**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	10.00	START DATE	8/9/93 15:15
		FINISH DATE	8/9/93 16:25
GEOLOGIST	B. J. Coel	APPROVED BY	S. T. Godard
		R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR	DRILLER	E. Miles
DRILLING METHOD	Hollow Stem Auger	EQUIPMENT	CME - 850
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Fire Training Area		

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
				Color, Texture, Moisture, etc.		146.33	
0	1/1/2/3	2:2		<b>Silt:</b> olive gray (5Y 4/2), poorly graded, soft, non-plastic, dry; abundant wood chips and roots. (ML)		146	BH = 6 ppm, BZ = <1 ppm, HS = 0 ppm. Collected sample 01-SB-03-01 and 01-SB-03-DS-01.
2	1/2/2/3	2:2		<b>Silt:</b> dark olive gray (5Y 3/2), poorly graded, soft, non-plastic, dry; rootlets with oxidation. (ML)		144	BH = 0 ppm, HS = 0 ppm. Collected sample 01-SB-03-02.
4	1/1/2/3	2:2		<b>Silt:</b> olive (5Y 4/3), poorly graded, soft, non-plastic, moist; wood chips and twigs, oxidation zones along rootlets. (ML)		142	BH = 1 ppm, HS = 0 ppm. Collected sample 01-SB-03-03.
6	1/1/2/2	2:2		<b>Clayey Silt:</b> black (5Y 2.5/2), poorly graded, soft, low plasticity, moist; twigs, more finely grained than above, mat of roots near top, silt layer at top of core without clays. (ML)		140	BH < 1 ppm. Collected sample 01-SB-03-04.
8						138	
10							End of Borehole at 10' BGS.

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	10.00	START DATE	8/10/93 09:40	FINISH DATE	8/10/93 10:45
GEOLOGIST	B. J. Coel	APPROVED BY	S. T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Fire Training Area				

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		151.00	
0	1/2/5/10	2:2		<b>Gravelly Silt:</b> olive (5Y 4/3), fine grained, poorly graded, sub-round, soft, non-plastic, dry; abundant coarse gravel, sub-round, root mat at top, trace wood chips, platey, oxidation zones. (ML)		150	BZ = 0 ppm, BH = 6 ppm, HS = 0 ppm. Collected sample 01-SB-04-01.
2							
2	2/3/5/7	2:2		<b>Clayey Silt:</b> very dark gray (5Y 3/1), fine grained, poorly graded, soft, low plasticity, dry; wood chips, platey, trace oxidation zones along some plates. (ML)		148	BH = 20 ppm, BZ = 0 ppm, HS = 20 ppm. Collected sample 01-SB-04-02.
4							
4	3/3/5/5	2:2		<b>Clayey Silt:</b> dark olive gray (5Y 3/2), fine grained, poorly graded, low plasticity, moist; less clay, less plastic than above, trace pebbles, trace wood, no oxidation, platey, barely moist. (ML)		146	BH = 20 ppm, BZ = 0 ppm, HS = 20 ppm. Collected sample 01-SB-04-03.
6							
6	1/1/1/2	2:2		<b>Clayey Silt:</b> dark grayish brown (5Y 4/2), fine grained, poorly graded, soft, low plasticity, moist; less clay, less plastic than above, large pieces of wood and twigs, root mat, barely moist. (ML)		144	BH = 20 ppm, BZ = 0 ppm, HS = 35 ppm. Collected sample 01-SB-04-04.
8							
8						142	
10							
10							End of Borehole at 10' BGS.

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	42.50	START DATE	8/25/93 08:15	FINISH DATE	8/25/93 10:15
GEOLOGIST	R. V. Petrossian	APPROVED BY	S. T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	West of POL, near installation entrance.				

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0						147.01	
	1/5/6/10	2:2		<b>Gravelly Sand:</b> grayish brown (5YR 3/2), fine to coarse grained, well graded, sub-round, very soft, non-plastic, moist; very loose, slightly silty. (SW)			BG = 0 ppm, BZ = 0 ppm.
	3/3/4/3	2:2		<b>Sandy Silt:</b> olive gray (5Y 4/1), fine grained, moderate to poorly graded, sub-round, soft, non-plastic, moist; slightly gravelly at top 6". (ML)		145	
5	2/1/2/3	2:2		<b>Sandy Silt:</b> olive gray (5Y 3/2), fine grained, poorly graded, sub-round, very soft, non-plastic, moist; slightly mottled, reddish staining, wood chips. (ML)			BG = 0 ppm, BZ = 0 ppm, BH = 0 ppm.
	2/1/1/2	2:2		<b>Sandy Silt:</b> dark yellowish brown (10YR 4/2), fine grained, poorly graded, sub-round, very soft, non-plastic, moist; micaceous, small roots, light brown staining mostly along roots, discontinuous laminations. (ML)		140	
	1/2/1/2	2:2		<b>Silty Sand:</b> dark yellow brown (10YR 4/2), fine to medium grained, poorly graded, sub-round, very soft, non-plastic, moist; sandy interlayers, micaceous layers, decreasing silt downwards, light brown staining. (SP)			
10	2/3/4/4	2:2		<b>Silty Sand:</b> pale yellowish (10YR 6/2), fine to medium grained, poorly graded, sub-angular, very soft, non-plastic, moist; moderately to loose sand 0.7' from top. (SM)		135	BZ = 0 ppm, BH = 0 ppm.
	1/2/3/2	2:2		<b>Silty Sand:</b> as above. (SM)			
15	1/2/3/3	1.6:2		<b>Silty Sand:</b> dark yellowish brown (10YR 4/2), fine to medium grained, poorly to moderately graded, sub-angular, very soft, non-plastic, wet; moderately to loose sand, interlayered coarser intervals, reddish-brown staining, gravel at bottom, micaceous. (SM)		130	Water Level at 16.10' BGS. No samples collected below water table.
20						125	
25						120	

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

 PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30						115	
35						110	
40						105	
							End of Borehole at 42.5' BGS.

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	37.50	START DATE	8/27/93 09:20
GEOLOGIST	R. V. Petrossian	APPROVED BY	S. T. Godard
DRILLING COMPANY	11 CEOS/CEOR	DRILLER	E. Miles
DRILLING METHOD	Hollow Stem Auger	EQUIPMENT	CME - 850
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	On Tarmac, south of POL.		

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		142.05	
	2/2/4/4		2:2	<b>Silty Gravel:</b> dark yellowish brown (10YR 4/2), fine to coarse grained, well graded, sub-round, very soft, non-plastic, moist. (GW)			BG = 0 ppm.
	1/2/4/4		2:2	<b>Sandy Silt:</b> olive gray (5Y 4/1), fine to medium grained, poorly graded, sub-round, very soft, non-plastic, moist; silt is micaceous. (ML)		140	
	1/3/4/4		2:2	<b>Sandy Silt:</b> as above. (ML)			BG = 0 ppm, BZ = 0 ppm, BH = 0 ppm.
5	1/2/3/3		2:2	<b>Silty Sand:</b> dark yellow brown (10YR 4/2), fine to medium grained, poorly graded, sub-round, very soft, non-plastic, moist; silt interlayers, top slightly laminated with rootlets. (SM)		135	BG = 0 ppm, BZ = 0 ppm, BH = 0 ppm.
	3/3/3/4		2:2	<b>Silty Sand:</b> as above. (SM)			
10	3/3/3/3		1.6:2	<b>Gravelly Sand:</b> dark yellowish brown (10YR 4/2), fine to coarse grained, well graded, sub-round, very soft, non-plastic, wet; very gravelly interval around 1' from top. (SW)		130	
							Water Level at 12.9' BGS. No samples collected below water table.
15						125	
20						120	
25						115	

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

 PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30							
35							
						110	
							End of Borehole at 37.5' BGS.

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	41.00	START DATE	8/28/93 10:11	FINISH DATE	8/28/93 15:40
GEOLOGIST	R. V. Petrossian		APPROVED BY	S. T. Godard	
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	On Tarmac, southwest of POL.				

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		143.34	
0							Hole drilled out to 2', start sampling at 2'.
3	3/4/4/3	2:2		<b>Gravelly Sand:</b> dark yellowish brown (10YR 4/2), fine grained to medium gravel, well graded, sub-round, very soft, non-plastic, dry to moist; loose gravel, increasing sand and consistency downward. (SW)		140	BG = 0 ppm, BZ = 0 ppm.
5	2/1/1/2	2:2		<b>Silty Sand:</b> dark yellowish brown (10YR 4/2), fine to medium grained, poorly graded, sub-round, very soft, non-plastic, moist; sandy interlayers. (SM)			
8	1/1/1/2	2:2		<b>Silty Sand:</b> light brownish gray (5YR 6/1), fine to medium grained, poorly graded, sub-round, very soft, non-plastic, very moist; mostly fine micaceous sands with brown staining, small medium grained sandy interlayers. (SM)		135	Hit very hard substrate, consulting soil gas data.
10	13/16/20/16	2:2		<b>Silty Sand:</b> brownish gray (5YR 4/1), fine to medium grained, poorly graded, sub-round, hard, non-plastic, wet; permafrost layer 0.2' below top, saturated throughout, mostly medium grained sand. (SM)			BG = 0 ppm, BZ = 0 ppm.
12	16/25/30/33	1.7:2		<b>Silty Sand:</b> as above; permafrost entire length. (SM)		130	
15						125	BZ = 0 ppm, BH = 0 ppm.
20	50	0.7:2		<b>Gravelly Sand:</b> fine grained to coarse gravel, well graded, sub-angular, hard, non-plastic, wet. (SW)		120	Frozen with some free water.
25							No samples collected below water table.

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

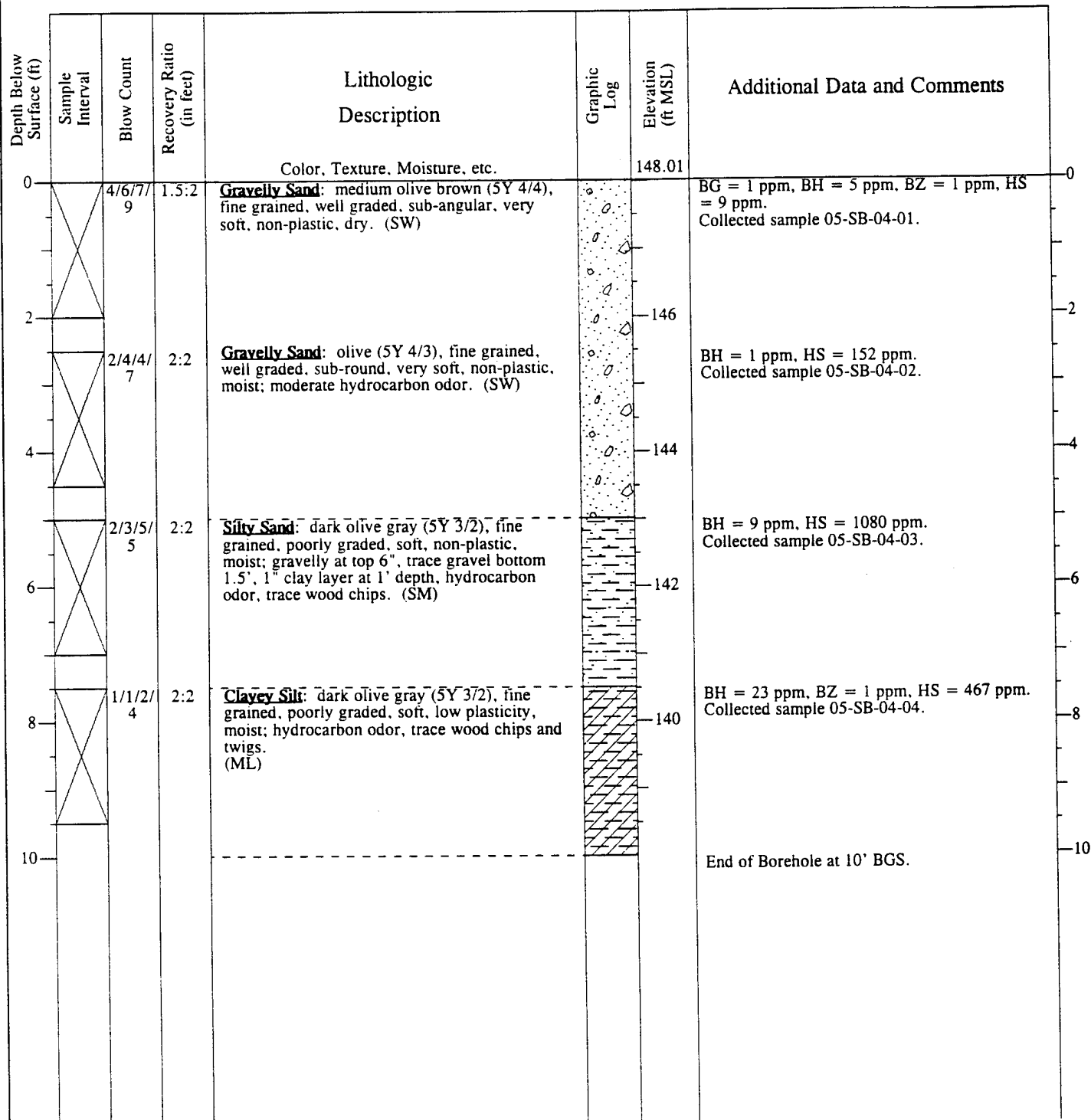
**LOG OF DRILLING OPERATIONS**

 PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30							
35							
40							
							End of Borehole at 41' BGS.



PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	10.00	START DATE	8/11/93 09:50	FINISH DATE	8/11/93 10:50
GEOLOGIST	B. J. Coel	APPROVED BY	S. T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	West of POL, near dormitory.				


**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	16.00	START DATE	8/11/93 13:30	FINISH DATE	8/11/93 14:45
GEOLOGIST	B. J. Coel	APPROVED BY	S. T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	West POL				

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		146.16	
0	1/2/2/4	2:2		<b>Gravelly Sand:</b> dark olive gray (5Y 3/2), fine grained, well graded, sub-round, very soft, non-plastic, moist; sand with fine to coarse gravel, dry at very top. (SW)			BG = 1 ppm, BH = 1 ppm, BZ = 1 ppm. Collected sample 05-SB-05-01.
3						144	
6	1/1/3/2	2:2		<b>Clayey Sand:</b> dark olive gray (5Y 3/2), fine grained, well graded, sub-round, soft, low plasticity, moist; sand predominant at top, more clay toward the bottom, abundant gravel in top half, abundant wood, root mat at bottom, organic, faint hydrocarbon odor. (SC)		141	BZ = 1 ppm, BH = 5 ppm, HS = 211 ppm. Collected sample 05-SB-05-02, all but 8240's.
6	1/3/3/2	1.5:2		<b>Clayey Silt:</b> dark olive gray (5Y 3/2), very fine grained, poorly graded, soft, low plasticity, moist; at about 6' very organic clayey silt. (MH)		138	BZ = 1 ppm, BH = 20 ppm. Collected 8240's for sample 05-SB-05-02.
9						135	
12	1/1/3/6	2:2		<b>Clayey Silt:</b> dark olive gray (5Y 3/2), very fine grained, poorly graded, soft, low plasticity, moist; 3" clay layer at top, 2" sand layer at bottom. (ML)		132	BH = 5 ppm, BZ = 1 ppm, HS = 31 ppm. Collected sample 05-SB-05-03.
15	1/1/2/3			<b>Clayey Silt:</b> very dark gray (5Y 3/1), very fine grained, poorly graded, soft, low plasticity, moist to wet; platy, fine interbedded clays and silts, may have hit water or capillary zone above water table, faint hydrocarbon odor. (ML)			BH = 5 ppm, BZ = 1 ppm. Collected sample 05-SB-05-04.
							End of Borehole at 16' BGS.

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	14.00	START DATE	8/12/93 08:20	FINISH DATE	8/12/93 09:20
GEOLOGIST	B. J. Coel	APPROVED BY	S. T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	West POL near boathouse.				

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		147.24	
0	1/2/3/6	1.5:2		<b>Silt:</b> olive (5Y 4/4), very fine grained, poorly graded, soft, non-plastic, dry; root mat at top, abundant rootlets throughout. (ML)			BG = 1 ppm, BZ = 1 ppm, BH = 14 ppm, HS = 103 ppm. Collected sample 05-SB-06-01.
3						144	
3	1/1/1/3	1.5:2		<b>Silt:</b> very dark gray (5Y 3/1), fine grained, poorly graded, soft, non-plastic, moist; trace wood chips and rootlets, moderate hydrocarbon odor, more oxidized at top 3". (ML)			BZ = 1 ppm, BH = 29 ppm, HS = 107 ppm. Collected sample 05-SB-06-02.
6						141	
9	1/1/1/3	1.5:2		<b>Clayey Silt:</b> dark olive gray (5Y 3/2), very fine grained, poorly graded, soft, medium plasticity, moist; large (3") piece of burnt wood, very organic, faint hydrocarbon odor, abundant rootlets. (ML)		138	BZ = 1 ppm, BH = 34 ppm, HS = 173 ppm. Collected sample 05-SB-06-03.
12	1/1/2/3	2:2		<b>Clayey Silt:</b> dark olive gray (5Y 3/2), very fine grained, poorly graded, soft, medium plasticity, moist; coarser silt (less clayey) layer at top and bottom, moderate hydrocarbon odor. (ML)		135	BZ = 1 ppm, BH = 17 ppm, HS = 17 ppm. Collected sample 05-SB-06-04.
							End of Borehole at 14' BGS.

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	41.80	START DATE	8/26/93 10:10	FINISH DATE	8/26/93 12:10
GEOLOGIST	R. V. Petrossian	APPROVED BY	S. T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	BLM housing area, north of installation boundary.				

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0	1/7/5/6	2:2		<b>Gravelly Sand:</b> pale yellowish brown (10YR 6/2), fine to coarse grained, well graded, sub-round, very soft, non-plastic, moist; 40% gravel, up to 1" in diameter. (SW)		151.90	BG = 0 ppm, BZ = 0 ppm.
	4/3/4/7	2:2		<b>Silty Sand:</b> dark yellowish brown (10YR 6/2), fine grained to fine gravel, moderately graded, sub-round, very soft, non-plastic, moist; mottled, wood chips, intervals of silt > 1 cm thick. (SM)		150	
5	3/5/5/5	2:2		<b>Silty Sand:</b> brownish gray (5YR 4/1), fine grained to coarse gravel, well graded, sub-round, very soft, non-plastic, moist; wood interval last 6", roots, and some yellow-red staining. (SM)			BZ = 0 ppm, BH = 0 ppm.
	3/4/4/5	2:2		<b>Sandy Silt:</b> olive gray (5Y 4/1), fine grained, poorly graded, well rounded, very soft, non-plastic, moist; wood chips, lots of organics, strong organic odor, layers of rootlets and wood chips. (ML)		145	
10	1/1/1/1	2:2		<b>Sandy Silt:</b> olive gray (5Y 4/2), fine grained, poorly graded, well rounded, very soft, non-plastic, moist; micaceous (small grains, well disseminated), fewer organics, some rootlets. (ML)		140	
	1/1/1/2	2:2		<b>Sandy Silt:</b> olive gray (5Y 4/2), fine to medium grained, poorly graded, sub-round, very soft, non-plastic, moist; contact at 1.4' below top between silt/medium sand, grades back to silt. (ML)			
15	1/3/2/3	2:2		<b>Sandy Silt:</b> olive gray (5Y 4/2), fine to medium grained, poorly graded, sub-round, very soft, non-plastic, wet; silt is slightly laminated, sand interlayers are distinctive, organics and rootlets, saturated in middle silt. (ML)		135	
	1/1/3/6	2:2		<b>Sandy Silt:</b> olive gray (5Y 4/2), fine to medium grained, poorly graded, sub-round, very soft, non-plastic, wet; alternating layers of sand and micaceous silt. (ML)			
20	1/4/4/6	2:2		<b>Silty Sand:</b> dark yellowish brown (10YR 4/2), medium grained, poorly graded, sub-angular, very soft, non-plastic, very moist; gravel interlayers. (SM)		130	No samples collected below water table.
				<b>Silty Sand:</b> as above; sand is saturated. (SM)			
25						125	

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT		LOCATION					
Galena Stage 3 RI/FS		Galena AFS Area, Alaska					
Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30						120	
35						115	
40							
							End of Borehole at 41.8' BGS.

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	16.00	START DATE	8/14/93 09:45	FINISH DATE	8/14/93 11:20
GEOLOGIST	B. J. Coel	APPROVED BY	S. T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Waste Accumulation Area, west of Building 1700.				

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		148.32	
0	1/1/2/2	1.5:2		<b>Sandy Silt:</b> olive (5Y 4/3), fine grained, poorly graded, sub-round, soft, non-plastic, moist; clayey layer 1" thick at 1.5', abundant roots, fairly homogeneous, with well distributed round gravel. (ML)		147	BG = 1 ppm, BH = 48 ppm, BZ = 1 ppm w/spikes of 64 ppm, HS = 583 ppm. Collected 06-SB-03-01.
3							
3	1/1/2/2	1:2		<b>Sandy Silt:</b> dark olive gray (5Y 3/2), fine grained, poorly graded, sub-round, soft, non-plastic, moist; sandy silt w/rounded gravel. (ML)		144	BZ = 48 ppm, donned respirators; BH = 48 ppm, HS = 489 ppm. Collected 06-SB-03-02.
6				<b>Silty Clay:</b> dark olive gray (5Y 3/2), very fine grained, poorly graded, firm, low plasticity, moist; hard clay layer. (ML)		141	
9							
9	1/1/2/3	1.5:2		<b>Silt:</b> very dark gray (5Y 3/1), very fine grained, poorly graded, soft, non-plastic, moist; very homogeneous silt w/a few very fine sand layers, trace wood chips. (ML)			BZ = 32 ppm, BH = 48 ppm. Collected 06-SB-03-03, 8240's in duplicate.
12							
12	1/1/2/3	2:2		<b>Clayey Silt:</b> black (5Y 2.5/1), very fine grained, poorly graded, soft, low plasticity, moist; abundant wood chips. (ML)		138	BZ = 67 ppm, BH = 127 ppm, HS = 219 ppm. Collected 06-SB-03-03, all analytes except 8240 in duplicate.
15						135	
15	1/2/3/5	2:2		<b>Clayey Silt:</b> as above; abrupt change to sand. (ML) <b>Sand:</b> olive gray (5Y 4/2), fine grained, poorly graded, sub-angular, very soft, non-plastic, moist; change to sand at 6", small silty clay layer (about 2") at 1.5'. (SP)			BZ = 17 ppm, BH = 230 ppm, HS = 25 ppm. Collected 06-SB-03-04.
							End of Borehole at 16' BGS.

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & Background. BGS = Below Ground Surface  
 ppm = parts per million

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	40.00	START DATE	8/24/93 09:25	FINISH DATE	8/24/93 10:50
GEOLOGIST	R. V. Petrossian	APPROVED BY	S. T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles, T. Laney	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	West Unit - North of west end of runway.				

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
				Color, Texture, Moisture, etc.		142.62	
0	1/1/1/1	1	1.9:2	<b>Sandy Silt:</b> dark yellowish brown (10YR 4/2), fine grained, poorly graded, sub-round, very soft, non-plastic, moist; grass, roots at top 3", gravel at top. (ML)			
	1/1/2/3	3	1.8:2	<b>Silty Sand:</b> dark yellowish brown (10YR 4/2), fine grained, poorly graded, sub-round, very soft, non-plastic, moist; some roots, intervals of medium grained sand < 1cm thick, wood chips. (SM)		140	BZ = 0 ppm.
5	1/2/1/1	1	2:2	<b>Silty Sand:</b> as above, moist to wet at bottom; 6" interval of medium sand from 1'-1.5', very fine sand from 1.5'-2', few rootlets, wood chips. (SM)			BH = 0 ppm.
	1/1/2/3	3	2:2	<b>Sandy Silt:</b> dark yellowish brown (10YR 4/2), fine grained, poorly graded, sub-round, very soft, non-plastic, moist; 0.7' interval of silt, abrupt change to medium grained sand at 6.7' BGL. (ML)		135	Cuttings = 0 ppm.
10	2/3/3/4	4	2:2	<b>Sand:</b> dark yellowish brown (10YR 4/2), sub-round, very soft, non-plastic, moist; 1' coarse sand to fine gravel. (SP)1			BZ = 0 ppm, BH = 0 ppm.
	3/4/5/5	5	2:2	<b>Gravelly Sand:</b> brownish gray (5YR 4/1), medium grained, poorly graded, sub-round, very soft, non-plastic, saturated; small component of silt. (SP)		130	Water Level at 11.92' BGS. No samples collected below water table.
15						125	
20						120	
25							

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

PROJECT		LOCATION					
Galena Stage 3 RI/FS		Galena AFS Area, Alaska					
Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30						110	
35						105	
40							End of Borehole at 40' BGS.



# LOG OF DRILLING OPERATIONS

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	9.50	START DATE	8/14/93 15:15	FINISH DATE	8/14/93 16:30
GEOLOGIST	B. J. Coel		APPROVED BY	S. T. Godard R.G.# 275 - Alaska	
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	West Unit, west of CAC Hangar.				

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		142.14	
0	1/5/5/8	1.5:2		<b>Gravelly Sand:</b> olive (5Y 4/2), fine grained, well grading, sub-angular, soft, non-plastic, wet. (SW)		142.14	BG = 1 ppm, BZ = 1 ppm, BH = 52 ppm, HS = 76 ppm. Collected 09-SB-01-01.
2						140	
2	2/3/3/4	1.5:2		<b>Clayey Silt:</b> very dark gray (5Y 3/1), very fine grained, poorly graded, soft, non-plastic, moist; Top 3" as above, some clay layers, but not very plastic. (ML)		140	BZ = 1 ppm, BH = 9.6 ppm, HS = 13 ppm. Collected 09-SB-01-02.
4						138	
4	1/1/2/2	2:2		<b>Clayey Silt:</b> very dark gray (5Y 3/1) to dark olive gray (5Y 3/2); abundant wood chips and oxidation zones, color change from reduced to more oxidized at 0.5'. (ML)		138	BZ = 1 ppm, BH = 9 ppm, HS = 1 ppm. Collected 09-SB-01-03.
6						136	
6	1/1/2/2	2:2		<b>Sand:</b> olive gray (5Y 4/2), fine grained, poorly graded, sub-angular, soft, non-plastic, moist; fine sand interbedded w/clayey silt layers, trace oxidation zones, trace fine gravel. (SP)		136	BZ = 1 ppm, BH = 1 ppm, HS = 1 ppm. Collected 09-SB-01-04.
8						134	
8							End of Borehole at 10' BGS.

**\*\*NOTES\*\***

**FID Data: BoreHole, Breathing Zone, HeadSpace, &  
BackGround. BGS = Below Ground Surface  
ppm = parts per million**

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS	LOCATION	Galena AFS Area, Alaska
TOTAL DEPTH	38.50	START DATE	8/29/93 09:20
GEOLOGIST	R. V. Petrossian	APPROVED BY	S. T. Godard
DRILLING COMPANY	11 CEOS/CEOR	DRILLER	E. Miles
DRILLING METHOD	Hollow Stem Auger	EQUIPMENT	CME - 850
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head		
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	Near southeast corner of CAC hangar.		

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description  Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0						143.05	
	6/8/7/8	2:2		<b>Gravelly Sand:</b> brownish gray (5YR 4/1), fine grained to fine gravel, well graded, sub-round, very soft, non-plastic, moist; 40% gravel, very coarse sand, very loose. (SW)			Started sampling at 1', drilled through tarmac. BG = 0 ppm, BZ = 0 ppm.
	1/4/3/4	2:2		<b>Gravelly Sand:</b> as above. (SW)			BH = 0 ppm, BZ = 0 ppm.
5	1/2/2/3	2:2		<b>Sandy Silt:</b> dusky yellow brown (10YR 2/2), poorly graded, sub-round, soft, non-plastic, moist; occasional pebbles. (ML)			BH = 0 ppm, BZ = 0 ppm.
	1/2/4/8	2:2		<b>Organic Silt:</b> olive gray (5Y 4/1), fine grained, poorly graded, sub-round, very soft, low plasticity, moist; gravel at top, lots of organics, strong sulphur odor, black staining, micaceous. (OL)			Sewer odor.
10	1/1/1/4	2:2		<b>Sandy Silt:</b> olive gray (5Y 4/1), fine grained, poorly graded, sub-round, very soft, non-plastic, moist; 0.3' color change, increase in grain size, interlayers of medium grained sand, slightly laminated sand layer at 1.5'. (ML)			
	3/4/4/5	2:2		<b>Silty Sand:</b> dark yellowish brown (10YR 4/2), fine to medium grained, poorly graded, sub-round, very soft, non-plastic, moist; sandy interlayers, well defined breaks, organics, high silt content, last 3" are medium grained sand. (SM)			
15	2/3/4/3	2:2		<b>Gravelly Sand:</b> pale yellowish brown (10YR 6/2), fine grained to fine gravel, poorly to moderately graded, sub-round, very soft, non-plastic, moist; sand with pebbles and fines, about 40% fine gravel. (SP)			Water Level at 15.25' BGS.
				<b>Silty Sand:</b> pale yellowish brown (10YR 6/2), fine grained to fine gravel, moderately graded, sub-round, very soft, non-plastic, wet; sandy. (SM)			No samples collected below water table.
20							
25							

**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

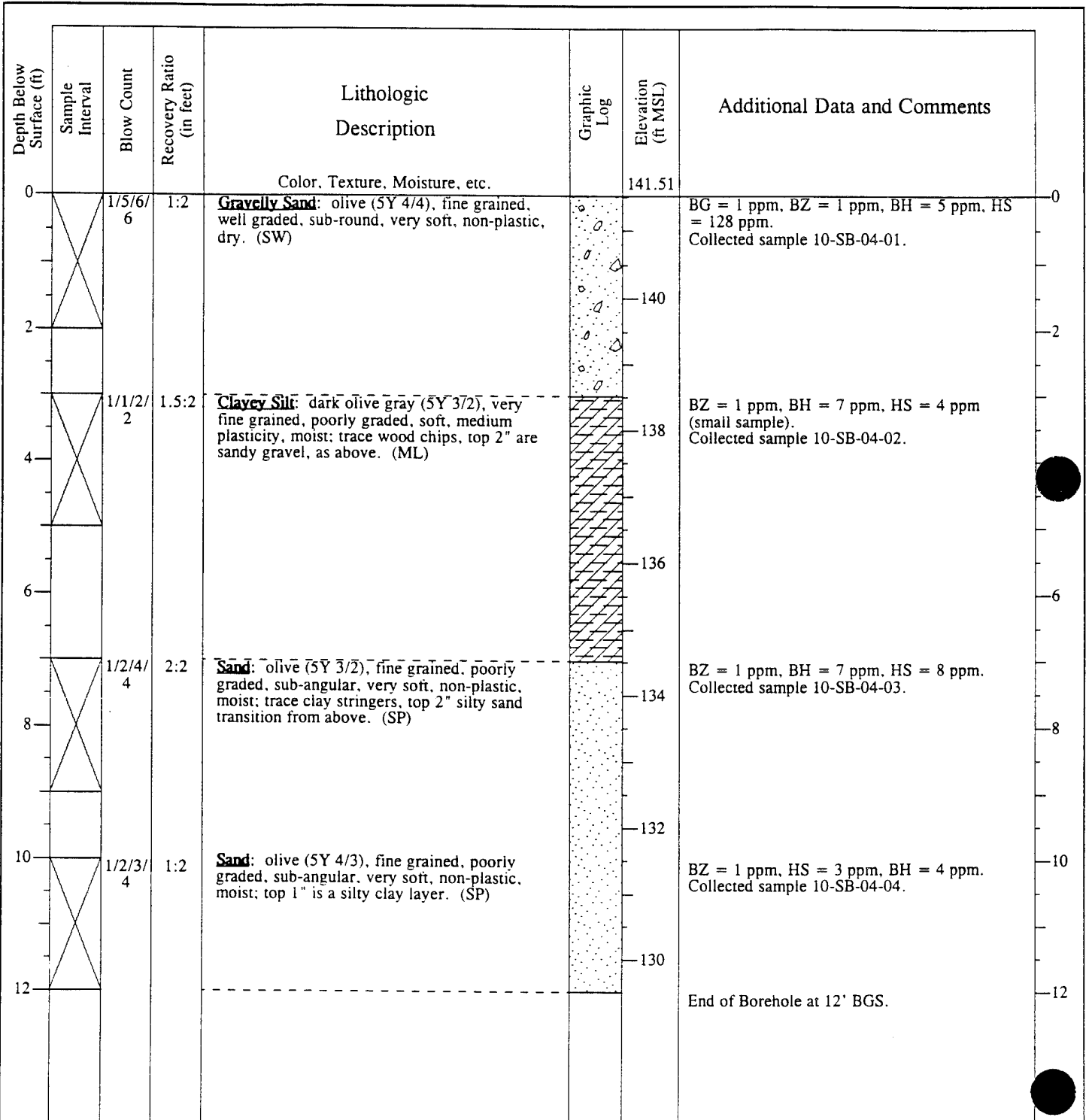
**LOG OF DRILLING OPERATIONS**

 PROJECT Galena Stage 3 RI/FS LOCATION Galena AFS Area, Alaska

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description Color, Texture, Moisture, etc.	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
30							
35							
						110	
						105	
							End of Borehole at 38.5' BGS

**LOG OF DRILLING OPERATIONS**

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	12.00	START DATE	8/12/93 14:10	FINISH DATE	8/12/93 15:30
GEOLOGIST	B. J. Coel	APPROVED BY	S. T. Auger	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	New Vehicle Maintenance Building (NVMB)				


**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

PROJECT	Galena Stage 3 RI/FS		LOCATION	Galena AFS Area, Alaska	
TOTAL DEPTH	13.00	START DATE	8/13/93 10:40	FINISH DATE	8/13/93 12:25
GEOLOGIST	B. J. Coel	APPROVED BY	S. T. Godard	R.G.#	275 - Alaska
DRILLING COMPANY	11 CEOS/CEOR		DRILLER	E. Miles	
DRILLING METHOD	Hollow Stem Auger		EQUIPMENT	CME - 850	
DRILL BIT TYPE AND SIZE	4 1/4" ID H.S.A. with 8 1/4" OD Cutter Head				
BORING LOCATION (ST. ADDRESS OR DESCRIPTION)	NVMB - Northwest corner of Building 1572.				

Depth Below Surface (ft)	Sample Interval	Blow Count	Recovery Ratio (in feet)	Lithologic Description	Graphic Log	Elevation (ft MSL)	Additional Data and Comments
0				Color, Texture, Moisture, etc.		142.76	
0	2/2/4/6	1.5:2		<b>Gravelly Sand:</b> olive (5Y 4/4), fine grained, well graded, sub-angular, very soft, non-plastic, dry; trace wood, strong hydrocarbon odor. (SW)		142	BG = 1 ppm, BZ = 1 ppm, BH = 150 ppm. Collected sample 10-SB-05-01.
2						140	
4	2/2/4/4	1.5:2		<b>Clayey Silt:</b> very dark gray (5Y 3/1), very fine grained, poorly graded, soft, medium plasticity, moist; abundant wood chips, sandy for top 6", hydrocarbon odor, oxidation zones, gravel at top. (ML)		138	BH = 34 ppm, BZ = 1 ppm. Collected sample 10-SB-05-02.
6	2/4/4/5	2:2		<b>Silty Clay:</b> very dark gray (5Y 3/1), very fine grained, poorly graded, soft, high plasticity, moist; grades to sticky clay in next 2 foot interval, no oxidation, hydrocarbon odor. (CL)		136	BH = 38 ppm, BZ = 1 ppm. Collected sample 10-SB-05-DS-02.
8	2/4/4/5	2:2		<b>Sand:</b> dark olive gray (5Y 3/2), fine grained, poorly graded, sub-angular, soft, non-plastic, moist; very homogeneous fine sand, strong hydrocarbon odor. (SP)		134	BH = 103 ppm, BZ = 5 ppm, HS = 349 ppm. Collected sample 10-SB-05-03.
10						132	
12	1/2/2/3	1.5:2		<b>Sand:</b> dark olive gray (5Y 3/2), fine grained, poorly graded, sub-angular, soft, non-plastic, moist; very homogeneous sand, as above, strong hydrocarbon odor. (SP)		130	BH = 23 ppm, BZ = 5 ppm, HS = 515 ppm. Collected sample 10-SB-05-04.
						130	End of Borehole at 13' BGS.

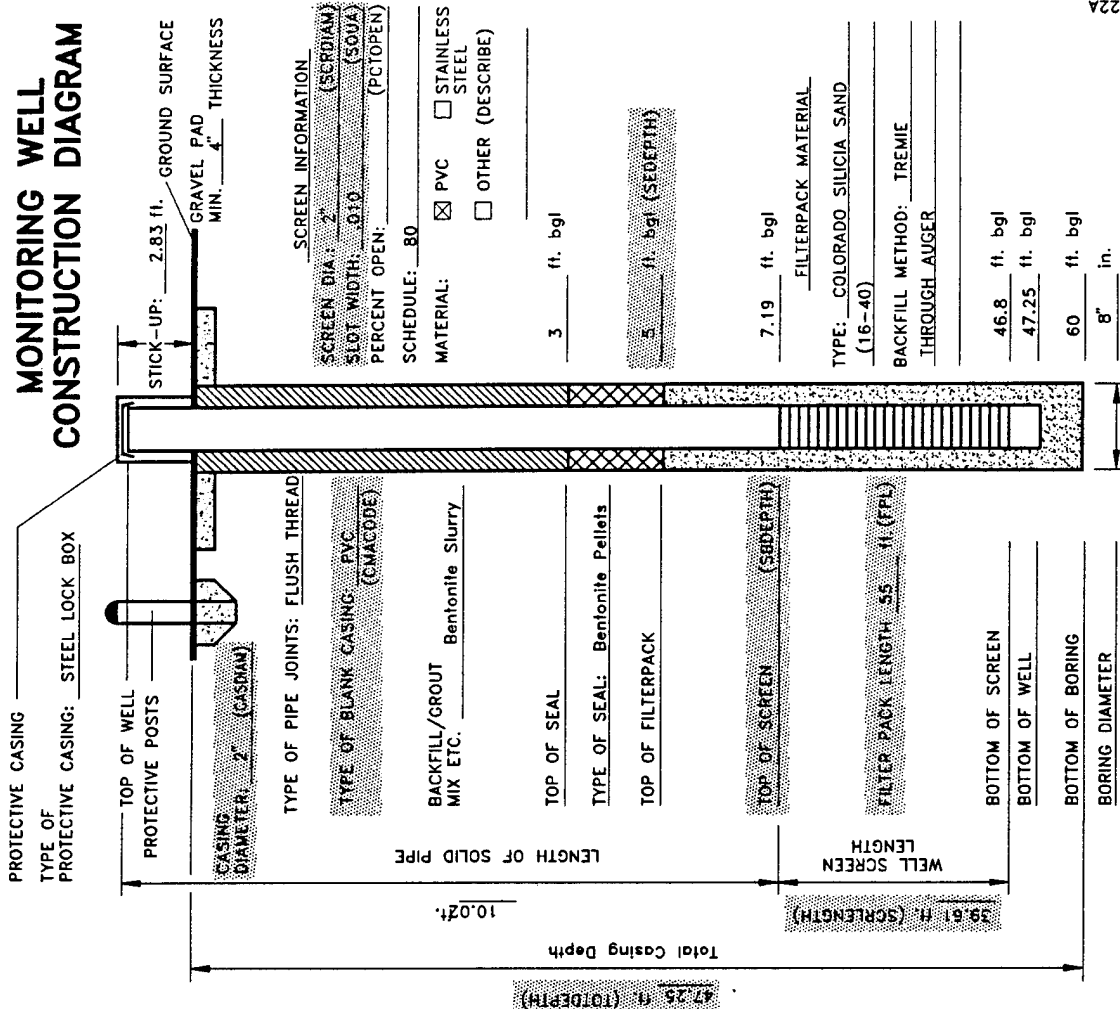
**\*\*NOTES\*\***

FID Data: BoreHole, Breathing Zone, HeadSpace, & BackGround. BGS = Below Ground Surface  
 ppm = parts per million

**1992 Monitoring Well Construction Diagrams**

Project (PROJID)	Well I.D. (LOCID)		
GALNA	01-MW-01		
Well Owner (VVL WELCODE)	Well Type (VVL WTCODE)		
USAF	MNW		
Installer	Date Started (INSDATE)	Date Completed	
PAC	08/03/92	08/03/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3925416	(East) 1811198		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
145.93	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
-			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Remarks (REMARKS)			

# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID) GALNA	Well I.D. (LOCID) 01-MW-02	
Well Owner (VVL WELCODE) USAF	Well Type (VVL WTCODE) MNW	
Installer PAC	Date Started (INSDATE) 08/06/92	Date Completed 08/06/92
Location Coordinates: (NCORD) (North) 3925632		
Elevation Top of Casing (MPELV) 145.47	Completion Method (VVL WCMCODE) GS	
Sole Source Aquifer Code (VVL SAQCODE) -		
Drilling Method HS	Completion Zone (VVL GZCODE) W	
Remarks (REMARKS)		

**MONITORING WELL CONSTRUCTION DIAGRAM**

PROTECTIVE CASING  
TYPE OF PROTECTIVE CASING: STEEL LOCK BOX

TOP OF WELL  
PROTECTIVE POSTS  
Casing Diameter: 2" (GASDIA)  
TYPE OF PIPE JOINTS: FLUSH THREAD  
TYPE OF BLANK CASING: PVC (CMACODE)  
BACKFILL/GROUT MIX ETC.: Bentonite Slurry  
TOP OF SEAL  
TYPE OF SEAL: Bentonite Pellets  
TOP OF FILTERPACK  
TOP OF SCREEN (SBDEPTH)  
FILTER PACK LENGTH 25 ft (FPL)  
BOTTOM OF SCREEN  
BOTTOM OF WELL  
BOTTOM OF BORING  
BORING DIAMETER

Total Casing Depth 27 ft (TODPTH)  
WELL SCREEN LENGTH 18.94 ft (SCRENGTH)  
LENGTH OF SOLID PIPE 9.98 ft

STICK-UP: 2.5 ft. GROUND SURFACE  
GRAVEL PAD MIN. 4" THICKNESS

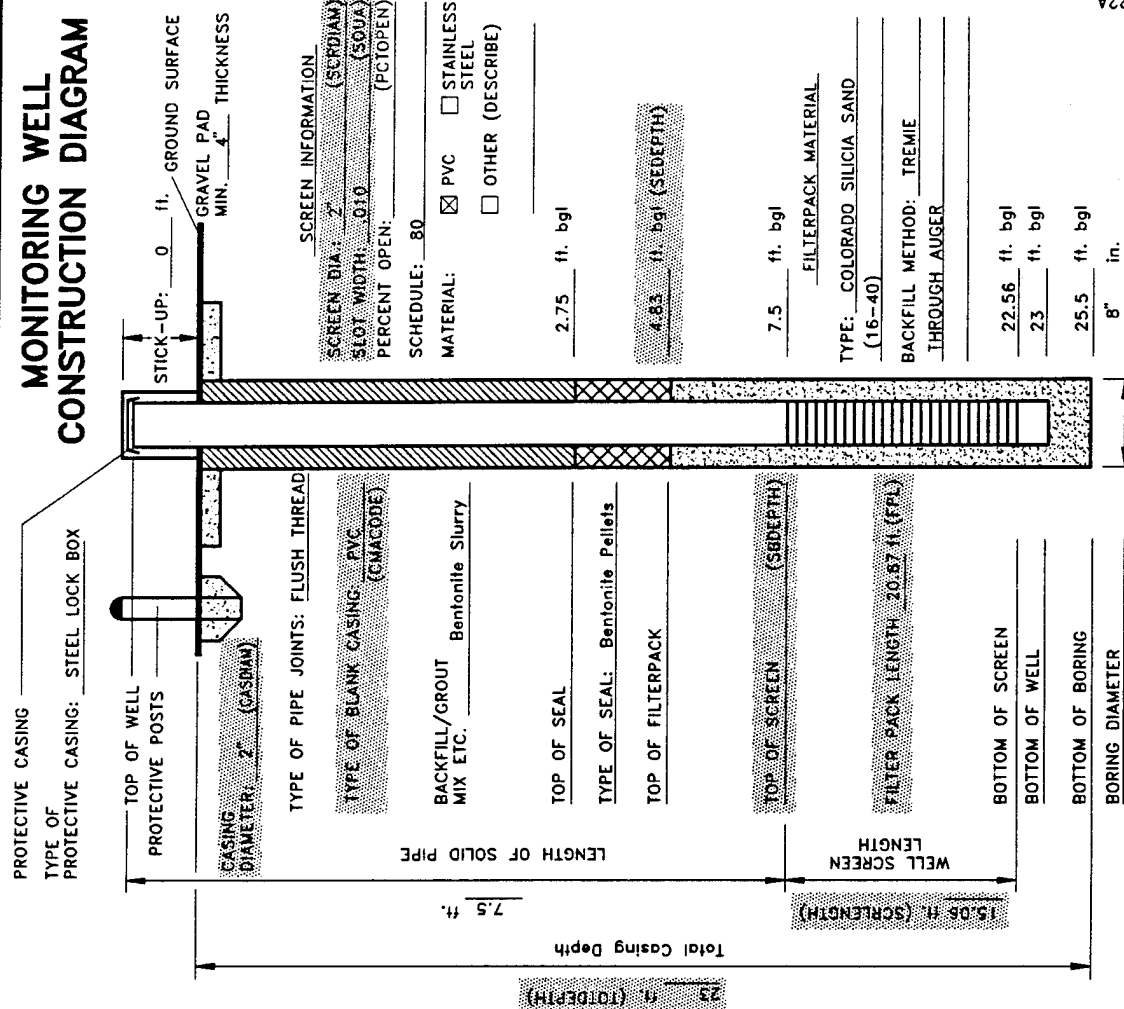
SCREEN INFORMATION  
SCREEN DIA: 2" (SCRDIA)  
SLOT WIDTH: .010 (SOWA)  
PERCENT OPEN: (PCTOPEN)  
SCHEDULE: 80  
MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)  
3 ft. bgl  
5 ft. bgl (SEDEPTH)  
7.48 ft. bgl  
FILTERPACK MATERIAL  
TYPE: COLORADO SILICIA SAND (16-40)  
BACKFILL METHOD: TREMIE THROUGH AUGER  
26.42 ft. bgl  
27 ft. bgl  
30 ft. bgl  
8" in.

F3622A



Project (PROJID)	Well I.D. (LOCID)		
GALNA	04-MW-03		
Well Owner (VWL WELCODE)	Well Type (VWL WTCODE)		
USAF	MNW		
Installer	Date Started (INSDATE)	Date Completed	
RVP	08/14/92	08/14/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3925460	(East) 1812402		
Elevation Top of Casing (MPELV)	Completion Method (VWL WCMCODE)		
145.5	GS		
Sole Source Aquifer Code (VWL SAQCODE)			
-			
Drilling Method	Completion Zone (VWL GZCODE)		
HS	W		
Remarks (REMARKS)			

# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID) GALNA	Well I.D. (LOCID) 05-MW-01		
Well Owner (VWL WELCODE) USAF	Well Type (VWL WTCODE) MNW		
Installer KLC	Date Started (INSDATE) 07/21/92	Date Completed 07/21/92	
Location Coordinates: (NCORD) (North) 3926266 (East) 1804906			
Elevation Top of Casing (MPELV) 150.66	Completion Method (VWL WCMCODE) GS		
Sole Source Aquifer Code (VVL SAQCODE) -			
Drilling Method HS	Completion Zone (VVL GZCODE) W		
Remarks (REMARKS)			

# MONITORING WELL CONSTRUCTION DIAGRAM

PROTECTIVE CASING  
TYPE OF PROTECTIVE CASING: STEEL LOCK BOX

TOP OF WELL  
PROTECTIVE POSTS

STICK-UP: 2.5 ft. GROUND SURFACE  
GRAVEL PAD MIN. 4" THICKNESS

CASING DIAMETER: 2" (CASDIAM)

TYPE OF PIPE JOINTS: FLUSH THREAD

TYPE OF BLANK CASING: PVC (CMACODE)

BACKFILL/GROUT MIX ETC.: Bentonite Slurry

TOP OF SEAL

TYPE OF SEAL: Bentonite Pellets

TOP OF FILTERPACK

TOP OF SCREEN (SBDEPTH)

FILTER PACK LENGTH 45 ft (FPL)

WELL SCREEN LENGTH

39.45 ft (SCRENGTH)

14.6 ft.

Total Casing Depth

52 ft. (TOTDEPTH)

BOTTOM OF SCREEN

BOTTOM OF WELL

BOTTOM OF BORING

BORING DIAMETER

SCREEN INFORMATION

SCREEN DIA.: 2" (SCRDIA)  
SLOT WIDTH: .010 (SQUA)  
PERCENT OPEN: (PCTOPEN)  
SCHEDULE: 80  
MATERIAL: ☒ PVC ☐ STAINLESS STEEL  
☐ OTHER (DESCRIBE)

8 ft. bgl

10 ft. bgl (SEDEPTH)

12.1 ft. bgl

FILTERPACK MATERIAL  
TYPE: COLORADO SILICIA SAND (16-40)  
BACKFILL METHOD: TREMIE THROUGH AUGER

51.55 ft. bgl  
52 ft. bgl  
55 ft. bgl  
8" in.

F3622A

Project (PROJID)	Well I.D. (LOCID)		
GALNA	05-MW-02		
Well Owner (VWL WELCODE)	Well Type (VWL WTCODE)		
USAF	MNV		
Installer	Date Started (INSDATE)	Date Completed	
BJC	07/23/92	07/23/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3925967	(East) 1805429		
Elevation Top of Casing (MPELV)	Completion Method (VWL WCMCODE)		
149.55	GS		
Sole Source Aquifer Code (VWL SAQCODE)			
-			
Drilling Method	Completion Zone (VWL GZCODE)		
HS	W		
Remarks (REMARKS)			

# MONITORING WELL CONSTRUCTION DIAGRAM

PROTECTIVE CASING  
TYPE OF PROTECTIVE CASING: STEEL LOCK BOX

TOP OF WELL  
PROTECTIVE POSTS

CASING DIAMETER: 2" (CASIDIA)

TYPE OF PIPE JOINTS: FLUSH THREAD

TYPE OF BLANK CASING: PVC (CMACODE)

BACKFILL/GROUT MIX ETC.: Bentonite Slurry

TOP OF SEAL

TYPE OF SEAL: Bentonite Pellets

TOP OF FILTERPACK

TOP OF SCREEN (SBDEPTH)

WELL SCREEN LENGTH

59.65 ft. (SCRENGTH)

13.3 ft.

Total Casing Depth

51 ft. (TOTDEPTH)

STICK-UP: 2.5 ft. GROUND SURFACE

GRAVEL PAD MIN. 4" THICKNESS

SCREEN INFORMATION

SCREEN DIA: 2" (SCRDIA)

SLOT WIDTH: 0.10 (SOD)

PERCENT OPEN: (PCOPEN)

SCHEDULE: 80

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

6.8 ft. bgl

8.8 ft. bgl (SEDEPTH)

10.8 ft. bgl

FILTERPACK MATERIAL

TYPE: COLORADO SILICIA SAND (16-40)

BACKFILL METHOD: TREMIE THROUGH AUGER

50.45 ft. bgl

51 ft. bgl

53 ft. bgl

8" in.

BOTTOM OF SCREEN

BOTTOM OF WELL

BOTTOM OF BORING

BORING DIAMETER

50.45 ft. bgl

51 ft. bgl

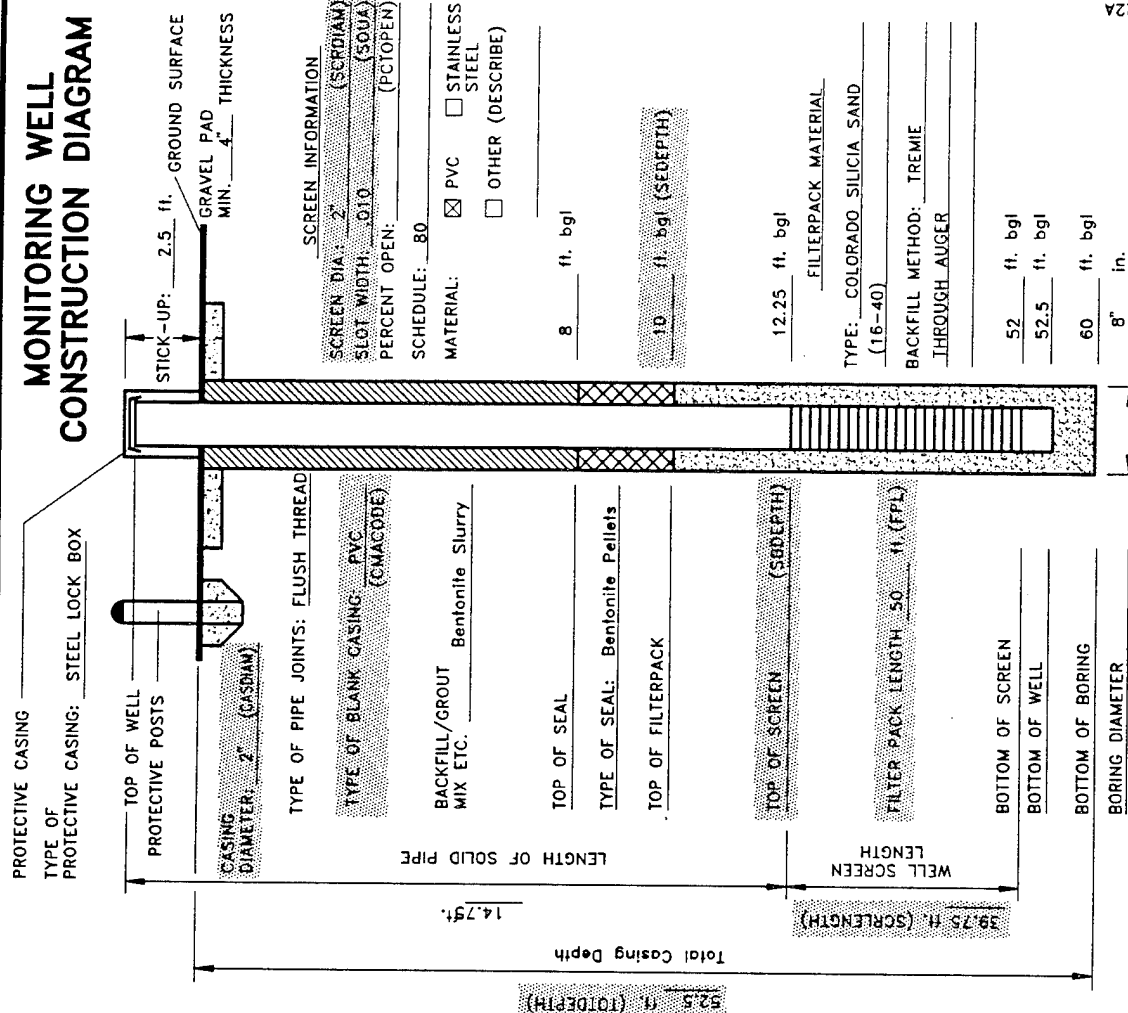
53 ft. bgl

8" in.

F3622A

Project (PROJID)	Well I.D. (LOCID)		
GALNA	05-MW-03		
Well Owner (VVL WELCODE)	Well Type (WL WTCODE)		
USAF	MNW		
Installer	Date Started (INSDATE)	Date Completed	
GSC	07/22/92	07/22/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3926037	(East) 1805184		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
147.97	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
-			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Remarks (REMARKS)			

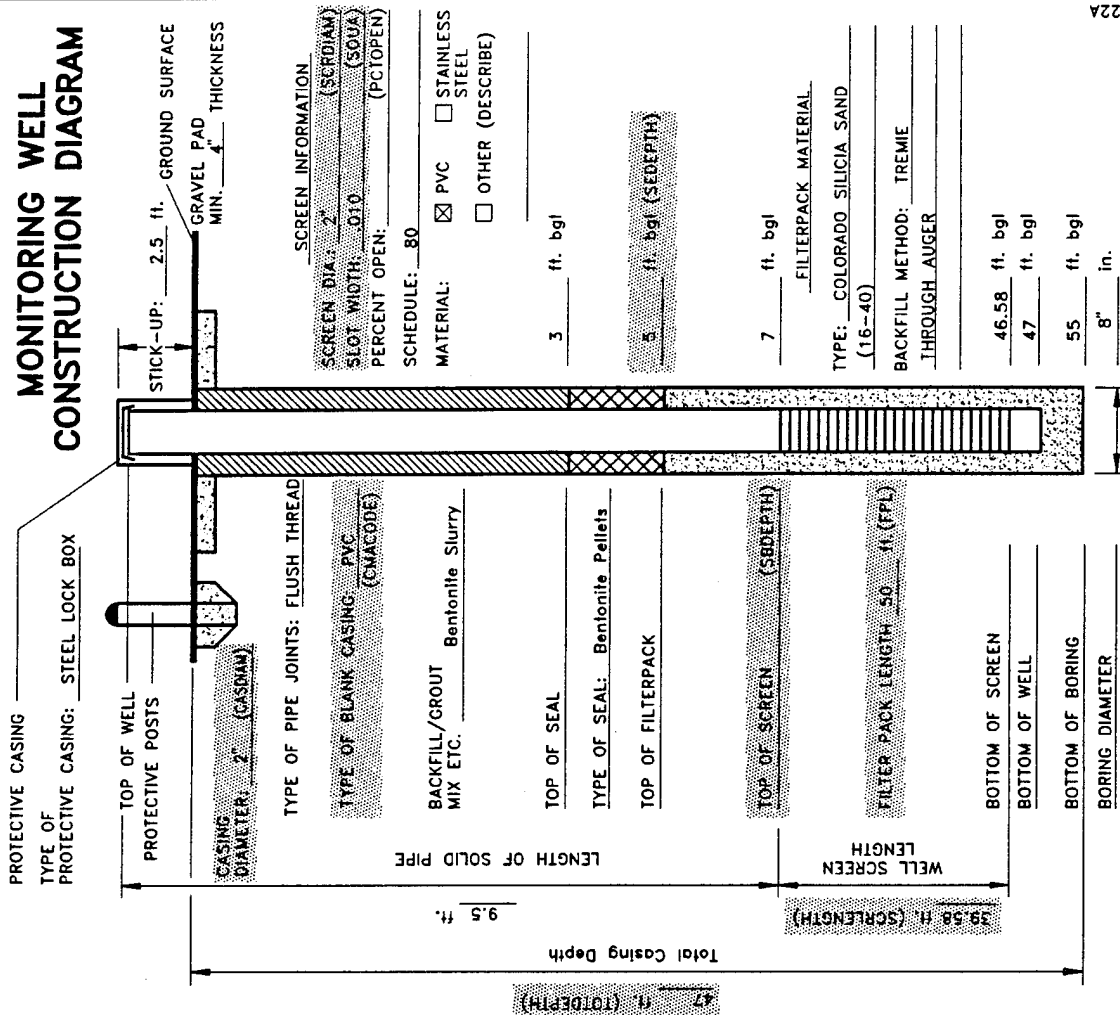
# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID)	Well I.D. (LOCID)		
GALNA	05-MW-04		
Well Owner (VWL WELCODE)	Well Type (VWL WTCODE)		
USAF	MNV		
Installer	Date Started (INSDATE)	Date Completed	
PAC	07/30/92	07/30/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3926029	(East) 1805030		
Elevation Top of Casing (MPELV)	Completion Method (VWL WCMCODE)		
145.84	GS		
Sole Source Aquifer Code (VWL SAQCODE)			
-			
Drilling Method	Completion Zone (VWL GZCODE)		
HS	W		
Remarks (REMARKS)			

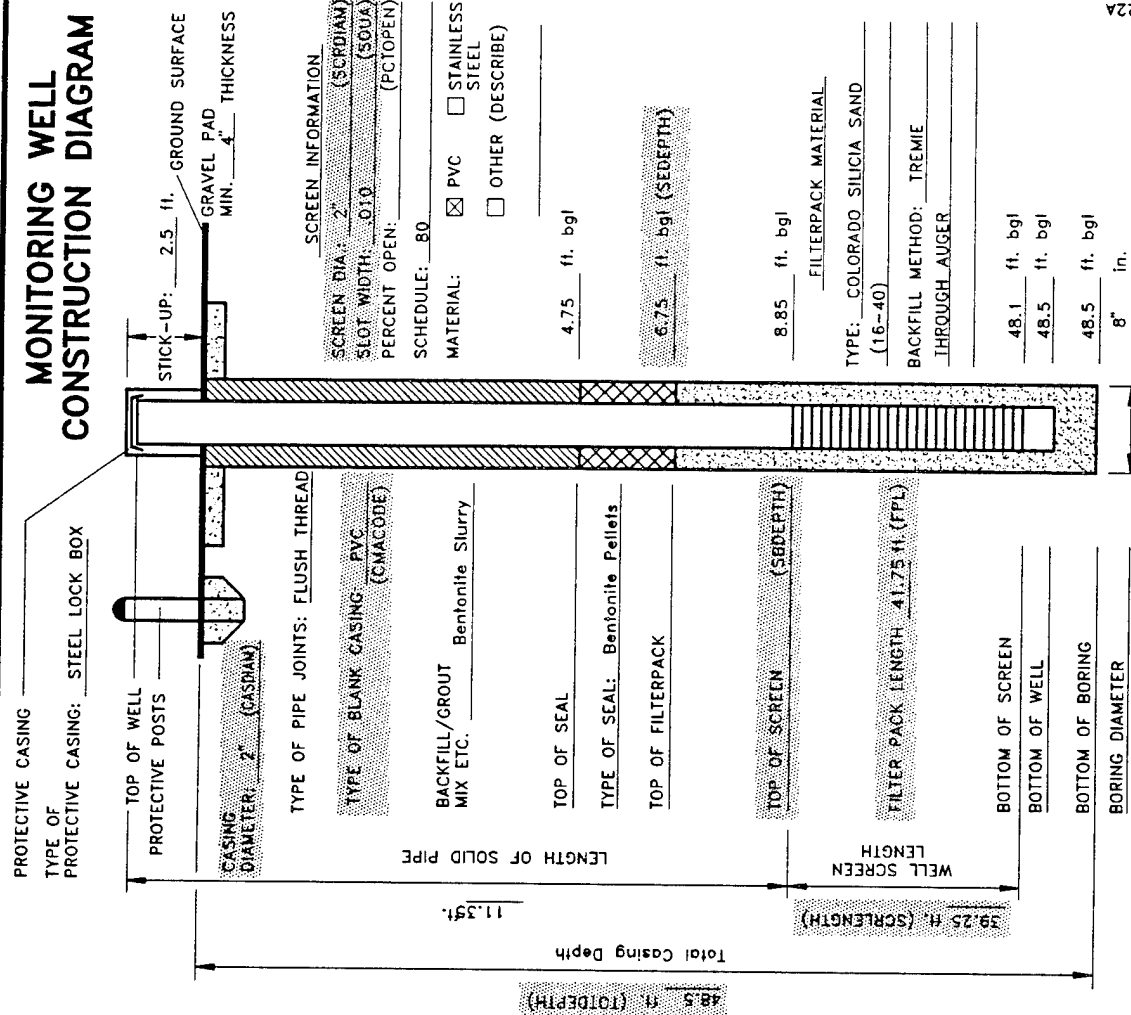
# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID)	Well I.D. (LOCID)		
GALNA	05-MW-05		
Well Owner (VWL WELCODE)	Well Type (VWL WTCODE)		
USAF	MNW		
Installer	Date Started (INSDATE)	Date Completed	
BJC	07/31/92	07/31/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3925970	(East) 1804904		
Elevation Top of Casing (MPELV)	Completion Method (VWL WCMCODE)		
145.58	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
-			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Remarks (REMARKS)			

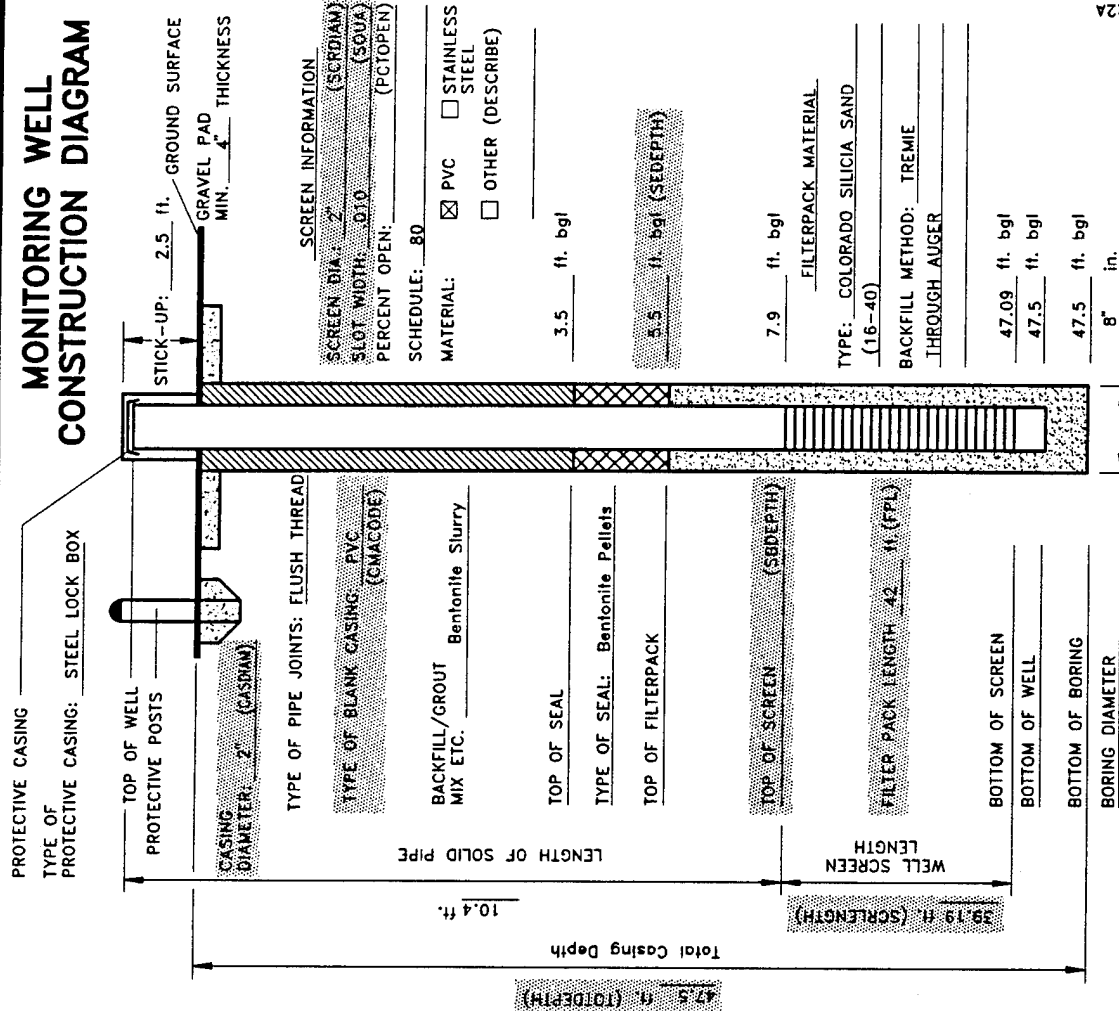
# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID)	Well I.D. (LOCID)		
GALNA	05-MW-06		
Well Owner (VVL WELCODE)	Well Type (WL WTCODE)		
USAF	MNW		
Installer	Date Started (INSDATE)	Date Completed	
PAC	08/01/92	08/01/92	08/01/92
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3926176	(East) 1804529		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
144.58	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
-			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Remarks (REMARKS)			

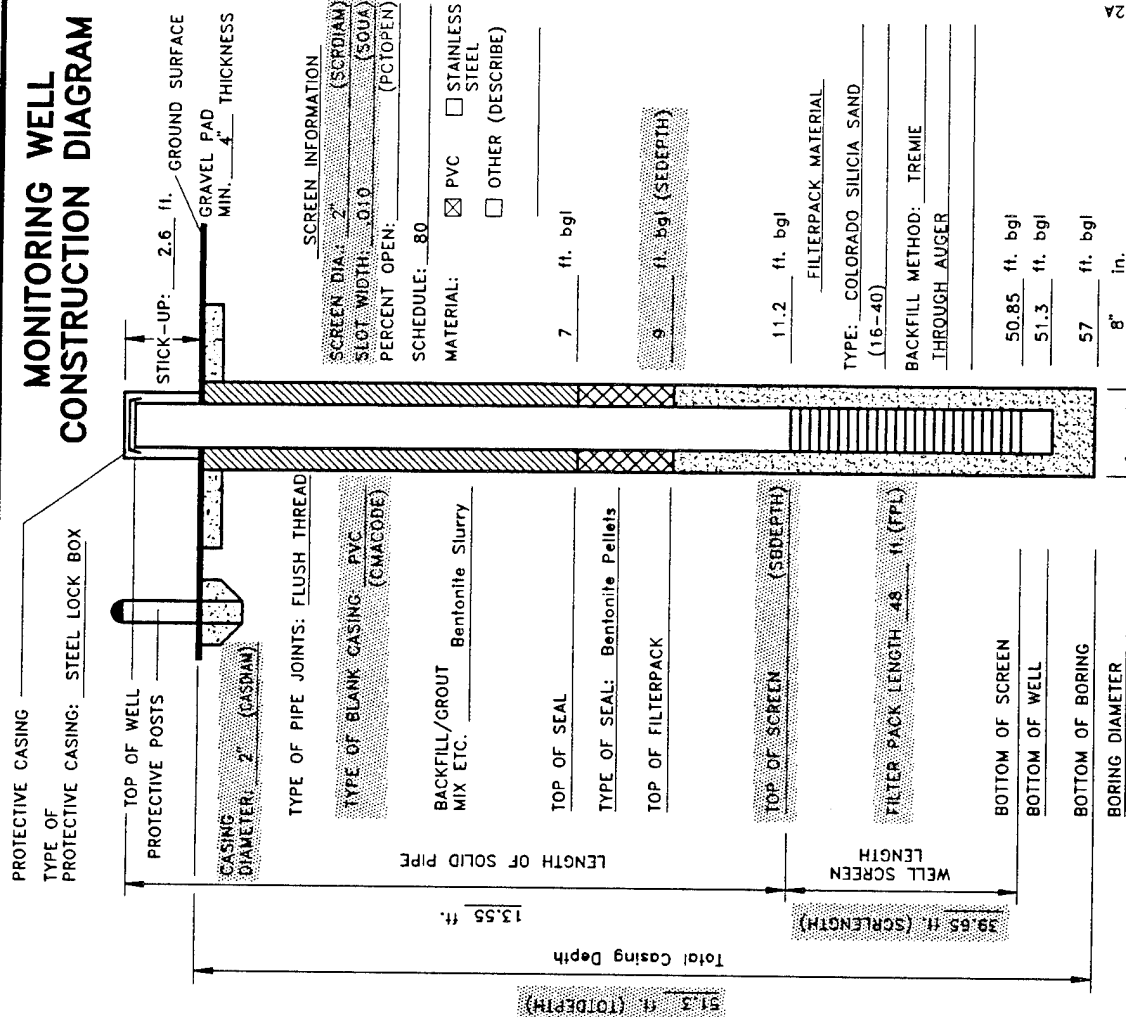
# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID) GALNA	Well I.D. (LOCID) 06-MW-01		
Well Owner (VVL WELCODE) USAF	Well Type (WL WTCODE) MNW		
Installer KLC/GJC	Date Started (INSDATE) 07/18/92	Date Completed 07/18/92	
Location Coordinates: (NCORD) (North) 3926640 (East) 1803589			
Elevation Top of Casing (MPELV) 151.3	Completion Method (VVL WCMCODE) GS		
Sole Source Aquifer Code (VVL SAQCODE) -			
Drilling Method HS	Completion Zone (VVL GZCODE) W		
Remarks (REMARKS)			

# MONITORING WELL CONSTRUCTION DIAGRAM

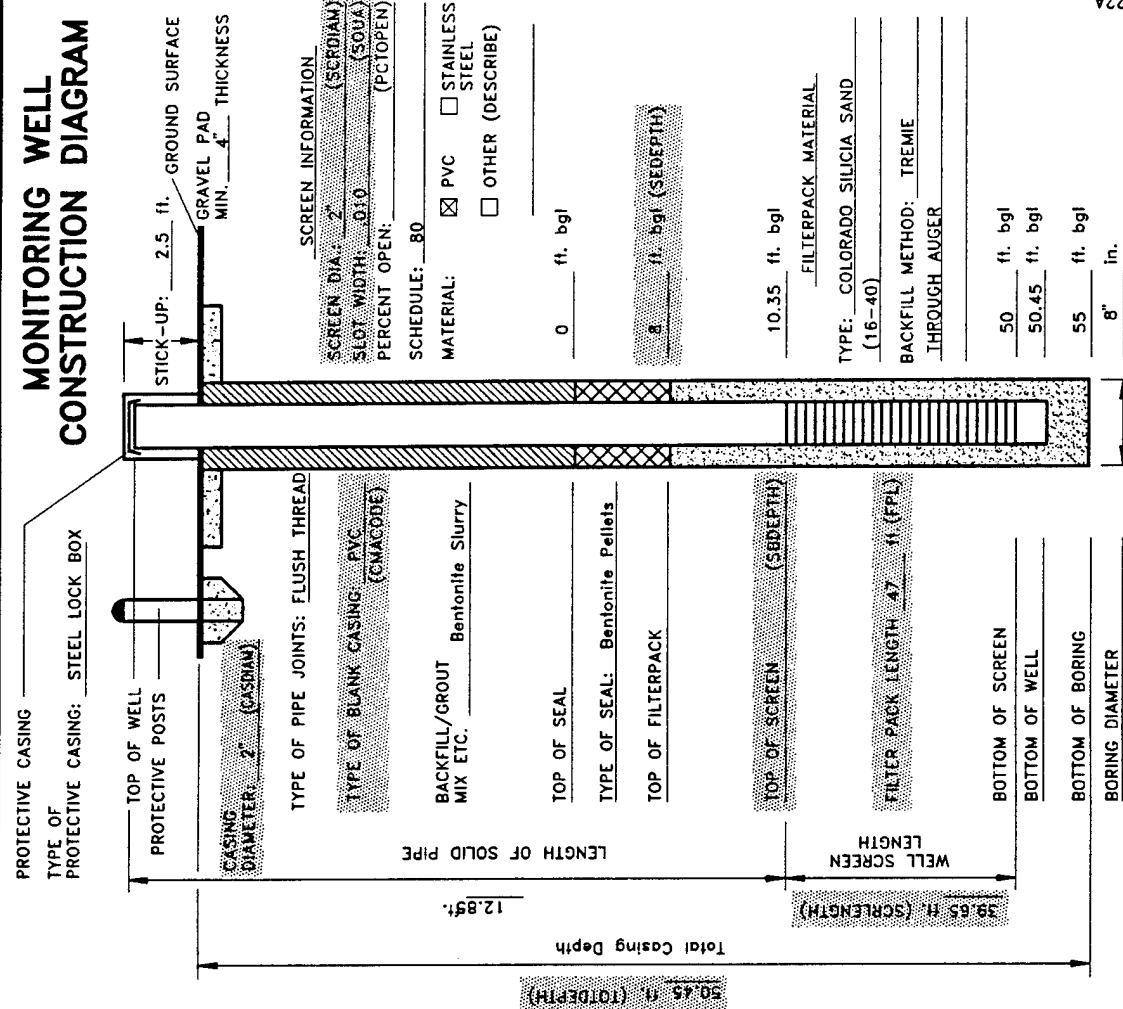


F3622A



Project (PROJID)	Well I.D. (LOCID)		
GALNA	06-MW-02		
Well Owner (VWL WELCODE)	Well Type (VWL WTCODE)		
USAF	MNV		
Installer	Date Started (INSDATE)	Date Completed	
KLC/GJC	07/17/92	07/17/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3926439	(East) 1803544		
Elevation Top of Casing (MPELV)	Completion Method (VWL WCMCODE)		
147.92	GS		
Sole Source Aquifer Code (VWL SAOCODE)			
-			
Drilling Method	Completion Zone (VWL GZCODE)		
HS	W		
Remarks (REMARKS)			

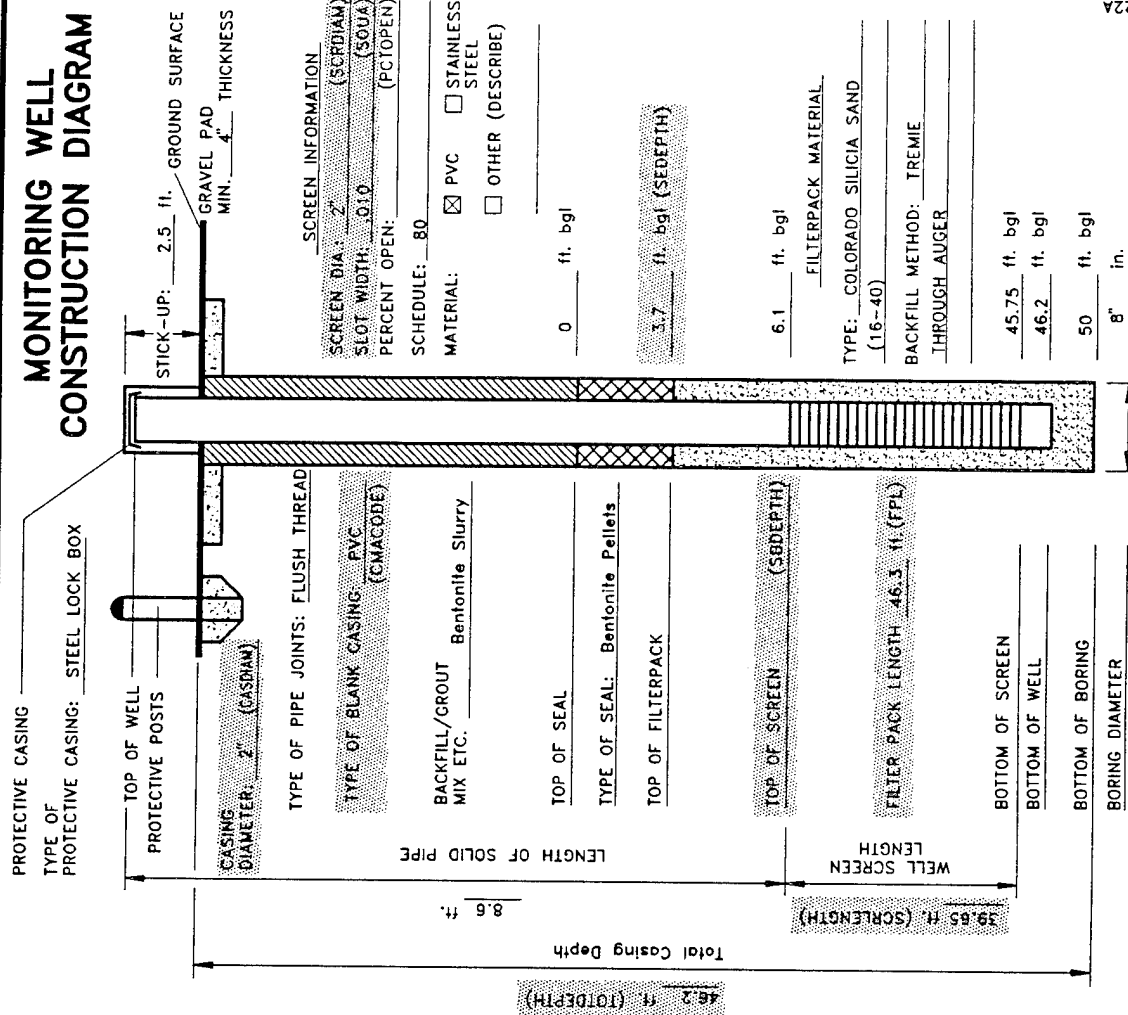
# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID) GALNA	Well I.D. (LOCID) 06-MW-03		
Well Owner (VVL WELCODE) USAF	Well Type (VVL WTCODE) MNV		
Installer KLC/GJC	Date Started (INSDATE) 07/14/92	Date Completed 07/14/92	
Location Coordinates: (NCORD) (North) 3926137 (East) 1803301			
Elevation Top of Casing (MPELV) 144.6	Completion Method (VVL WCMCODE) GS		
Sole Source Aquifer Code (VVL SAQCODE) -			
Drilling Method HS	Completion Zone (VVL GZCODE) W		
Remarks (REMARKS)			

# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID) <b>GALNA</b>	Well I.D. (LOCID) <b>06-MW-04</b>		
Well Owner (VVL WELCODE) <b>USAF</b>	Well Type (VWL WTCODE) <b>MNW</b>		
Installer <b>KLC/GJC</b>	Date Started (INSDATE) <b>07/15/92</b>	Date Completed <b>07/15/92</b>	
Location Coordinates: (NCORD) (North) <b>3926312</b> (ECORD) (East) <b>1803047</b>			
Elevation Top of Casing (MPELV) <b>142.71</b>	Completion Method (VVL WCMCODE) <b>GS</b>		
Sole Source Aquifer Code (VVL SAQCODE) <b>-</b>			
Drilling Method <b>HS</b>	Completion Zone (VVL GZCODE) <b>W</b>		
Remarks (REMARKS)			

## MONITORING WELL CONSTRUCTION DIAGRAM

PROTECTIVE CASING  
TYPE OF PROTECTIVE CASING: STEEL LOCK BOX

TOP OF WELL  
PROTECTIVE POSTS

CASING DIAMETER: 2" (CSDIAM)

TYPE OF PIPE JOINTS: FLUSH THREAD

TYPE OF BLANK CASING: PVC (CMACODE)

BACKFILL/GROUT MIX ETC.: Bentonite Slurry

TOP OF SEAL

TYPE OF SEAL: Bentonite Pellets

TOP OF FILTERPACK

TOP OF SCREEN (SDEPTH)

FILTER PACK LENGTH 46 ft (FPL)

BOTTOM OF SCREEN

BOTTOM OF WELL

BOTTOM OF BORING

BORING DIAMETER

Well Screen Length 39.65 ft (SLENGTH)

Total Casing Depth 46.2 ft (TDEPTH)

LENGTH OF SOLID PIPE 8.6 ft

STICK-UP: 2.5 ft

GROUND SURFACE

GRAVEL PAD MIN. 4" THICKNESS

SCREEN INFORMATION

SCREEN DIA: 2" (SCRDIA)

SLOT WIDTH: .010 (SQUA)

PERCENT OPEN: (PGTOPE)

SCHEDULE: 80

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

0 ft. bgl

4 ft. bgl (SDEPTH)

6.1 ft. bgl

FILTERPACK MATERIAL

TYPE: COLORADO SILICIA SAND (16-40)

BACKFILL METHOD: TREMIE THROUGH AUGER

45.75 ft. bgl

46.2 ft. bgl

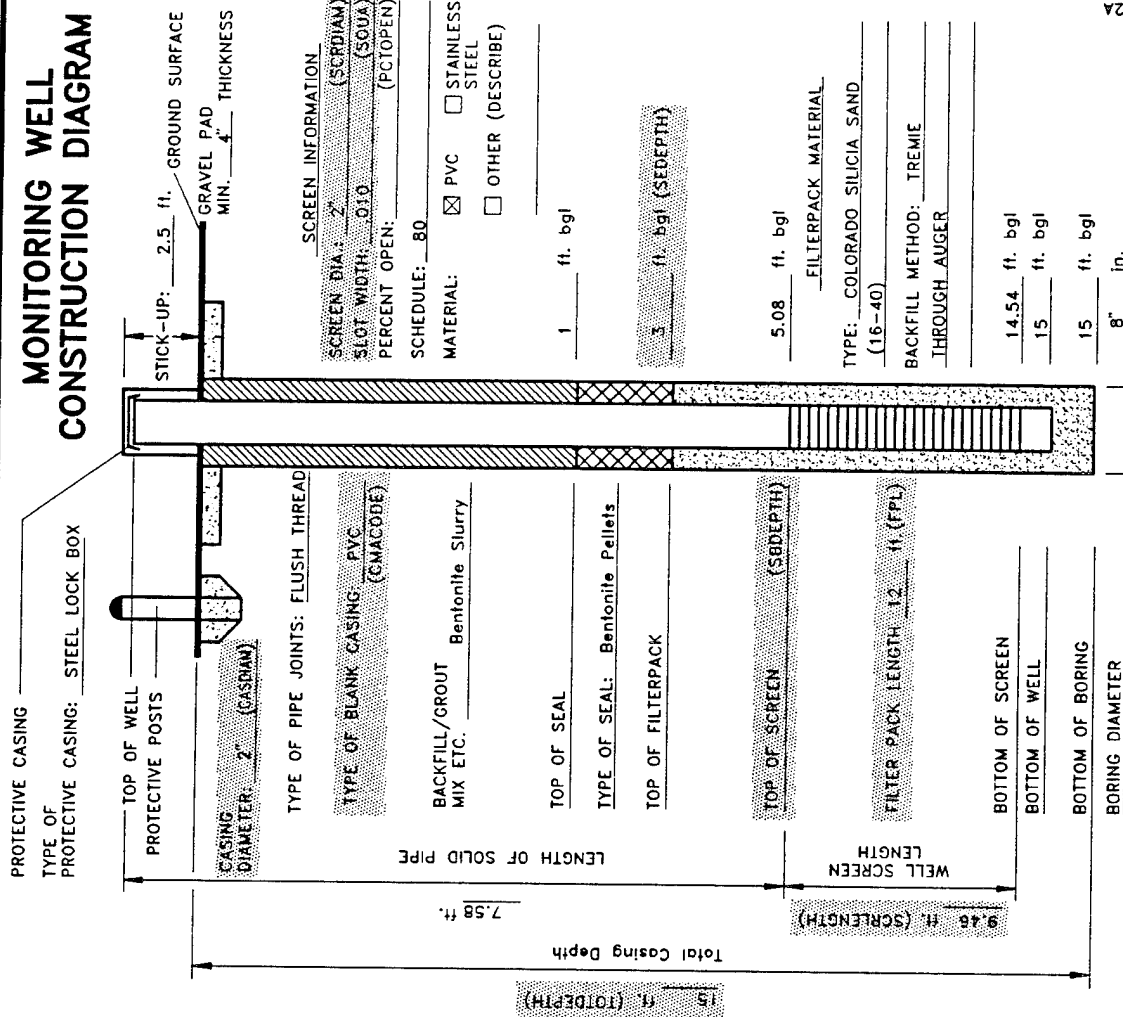
50 ft. bgl

8" in.

F3622A

Project (PROJID)	Well I.D. (LOCID)		
GALNA	07-MW-01		
Well Owner (VVL WELCODE)	Well Type (VVL WTCODE)		
USAF	MNW		
Installer	Date Started (INSDATE)	Date Completed	
RVP	08/11/92	08/11/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3914277	(East) 1840068		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
370.54	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
-			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Remarks (REMARKS)			

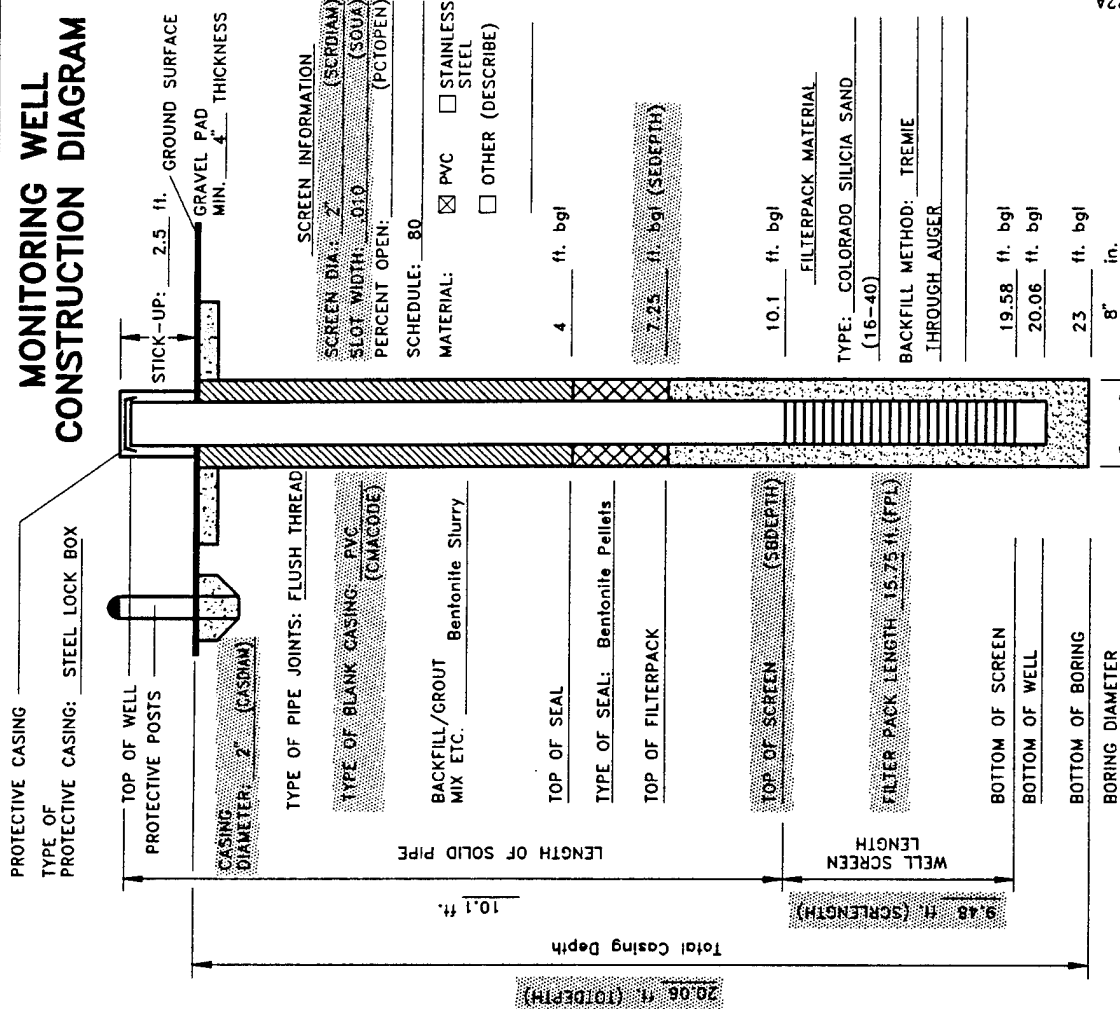
# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID)	Well I.D. (LOCID)		
GALNA	07-MW-02		
Well Owner (VWL WELCODE)	Well Type (VWL WTCODE)		
USAF	MNW		
Installer	Date Started (INSDATE)	Date Completed	
RVP	08/11/92	08/11/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3914547	(East) 1840139		
Elevation Top of Casing (MPELV)	Completion Method (VWL WCMCODE)		
362.92	GS		
Sole Source Aquifer Code (VWL SAQCODE)			
-			
Drilling Method	Completion Zone (VWL GZCODE)		
HS	W		
Remarks (REMARKS)			

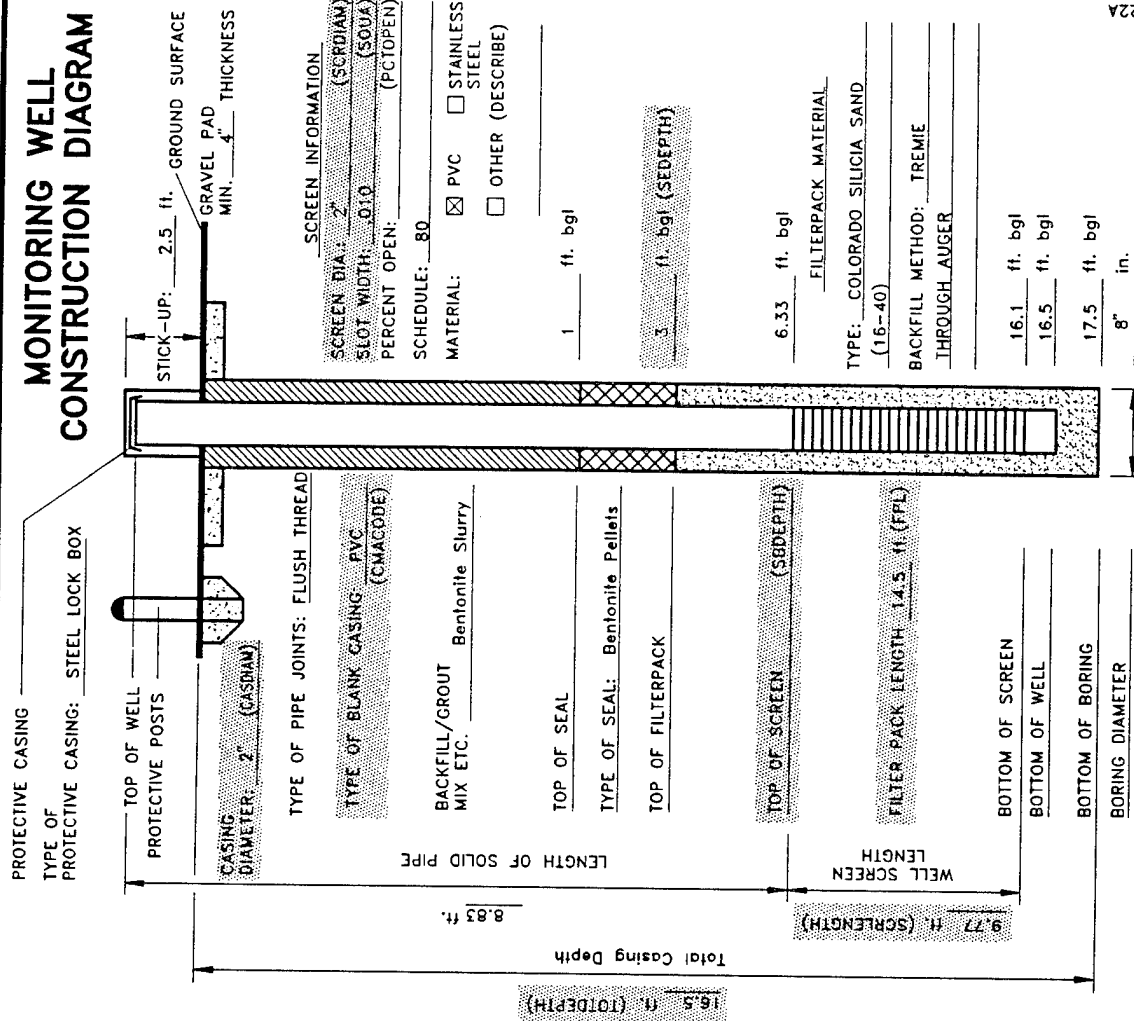
# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID)	Well I.D. (LOCID)		
GALNA	07-MW-03		
Well Owner (VWL WELCODE)	Well Type (VWL WTCODE)		
USAF	MNV		
Installer	Date Started (INSDATE)	Date Completed	
RVP	08/10/92	08/10/92	
Location Coordinates:			
(NCORD)	(ECORD)	(East)	
(North) 3914671	1839895		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
368.52	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
-			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Remarks (REMARKS)			

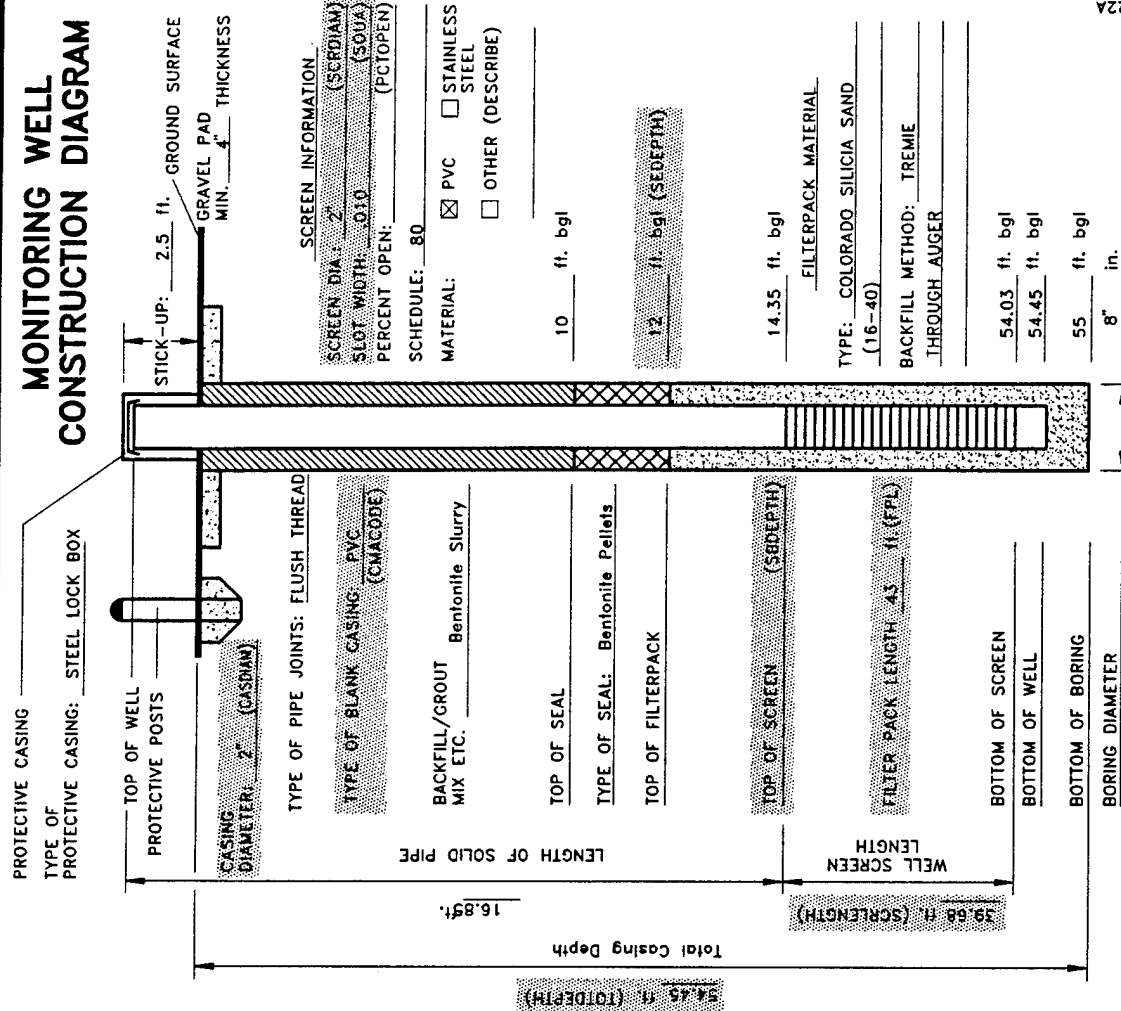
# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID)	Well I.D. (LOCID)		
GALNA	07-MW-04		
Well Owner (VWL WELCODE)	Well Type (VWL WTCODE)		
USAF	MNW		
Installer	Date Started (INSDATE)	Date Completed	
RVP	08/09/92	08/09/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3914455	(East) 1839655		
Elevation Top of Casing (MPELV)	Completion Method (VWL WCMCODE)		
390.08	GS		
Sole Source Aquifer Code (VWL SAOCODE)			
-			
Drilling Method	Completion Zone (VWL GZCODE)		
HS	W		
Remarks (REMARKS)			

# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID) GALNA	Well I.D. (LOCID) 09-MW-01		
Well Owner (VWL WELCODE) USAF	Well Type (VWL WTCODE) MNW		
Installer TAC	Date Started (INSDATE) 07/09/92	Date Completed 07/09/92	
Location Coordinates: (NCORD) (North) 3925887 (East) 1802988			
Elevation Top of Casing (MPELV) 142.54	Completion Method (VVL WCMCODE) GS		
Sole Source Aquifer Code (VVL SAQCODE) -			
Drilling Method HS	Completion Zone (VVL GZCODE) W		
Remarks (REMARKS)			

# MONITORING WELL CONSTRUCTION DIAGRAM

PROTECTIVE CASING  
TYPE OF PROTECTIVE CASING: STEEL LOCK BOX

TOP OF WELL  
PROTECTIVE POSTS

CASING DIAMETER: 2" (CSDIAM)

TYPE OF PIPE JOINTS: FLUSH THREAD

TYPE OF BLANK CASING: PVC (CMACODE)

BACKFILL/GROUT MIX ETC.: Bentonite Slurry

TOP OF SEAL

TYPE OF SEAL: Bentonite Pellets

TOP OF FILTERPACK

TOP OF SCREEN (SBDEPTH)

FILTER PACK LENGTH 52.1 ft (FPL)

BOTTOM OF SCREEN

BOTTOM OF WELL

BOTTOM OF BORING

BORING DIAMETER

STICK-UP: 2.5 ft. GROUND SURFACE  
GRAVEL PAD MIN. 4" THICKNESS

SCREEN INFORMATION  
SCREEN DIA: 2" (SCRDIA)  
SLOT WIDTH: .010 (SLOA)  
PERCENT OPEN: (PCTOPEN)  
SCHEDULE: 80  
MATERIAL: ☒ PVC ☐ STAINLESS STEEL  
☐ OTHER (DESCRIBE)

0 ft. bgl

2.9 ft. bgl (SEDEPTH)

5.12 ft. bgl

FILTERPACK MATERIAL  
TYPE: COLORADO SILICIA SAND (16-40)  
BACKFILL METHOD: TREMIE THROUGH AUGER

44.73 ft. bgl  
45.18 ft. bgl  
55 ft. bgl  
8" in.

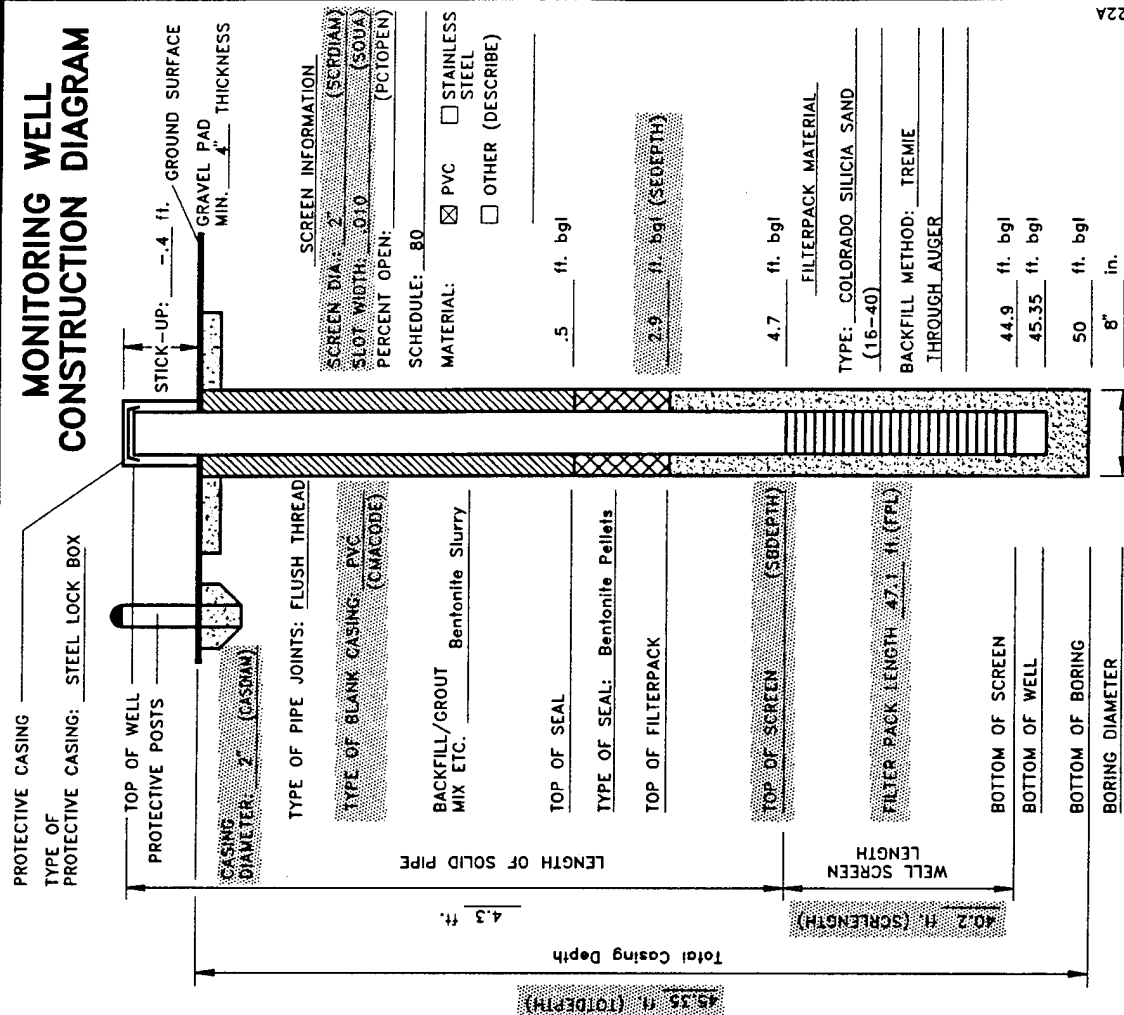
45.18 ft. (TOTDEPTH)  
7.62 ft.  
39.61 ft. (SCREENLENGTH)  
52.1 ft. (FPL)

F3622A



Project (PROJID)	Well I.D. (LOCID)		
GALNA	09-MW-02		
Well Owner (VVL WELCODE)	Well Type (WL WTCODE)		
USAF	MNW		
Installer	Date Started (INSDATE)	Date Completed	
GSC	07/09/92	07/09/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3925561	(East) 1802814		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
140.52	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
-			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Remarks (REMARKS)			

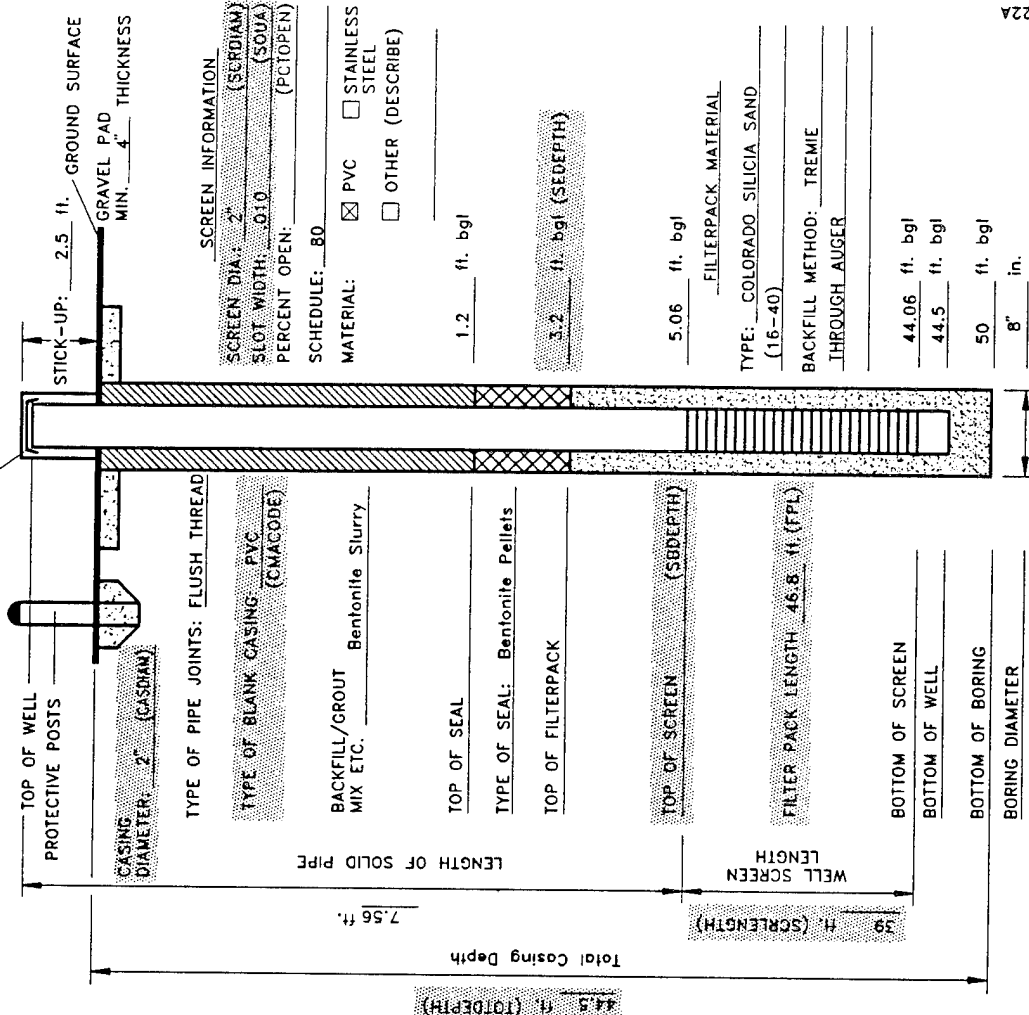
# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID)	Well I.D. (LOCID)		
GALNA	09-MW-03		
Well Owner (WV WELCODE)	Well Type (WV WTCODE)		
USAF	MNW		
Installer	Date Started (INSDATE)	Date Completed	
RVP	08/15/92	08/15/92	
Location Coordinates:			
(NCORD)	(ECORD)		
(North) 3926366	(East) 1802304		
Elevation Top of Casing (MPELV)	Completion Method (WV WCMCODE)		
143.77	GS		
Sole Source Aquifer Code (WV SAQCODE)			
-			
Drilling Method	Completion Zone (WV GZCODE)		
HS	W		
Remarks (REMARKS)			

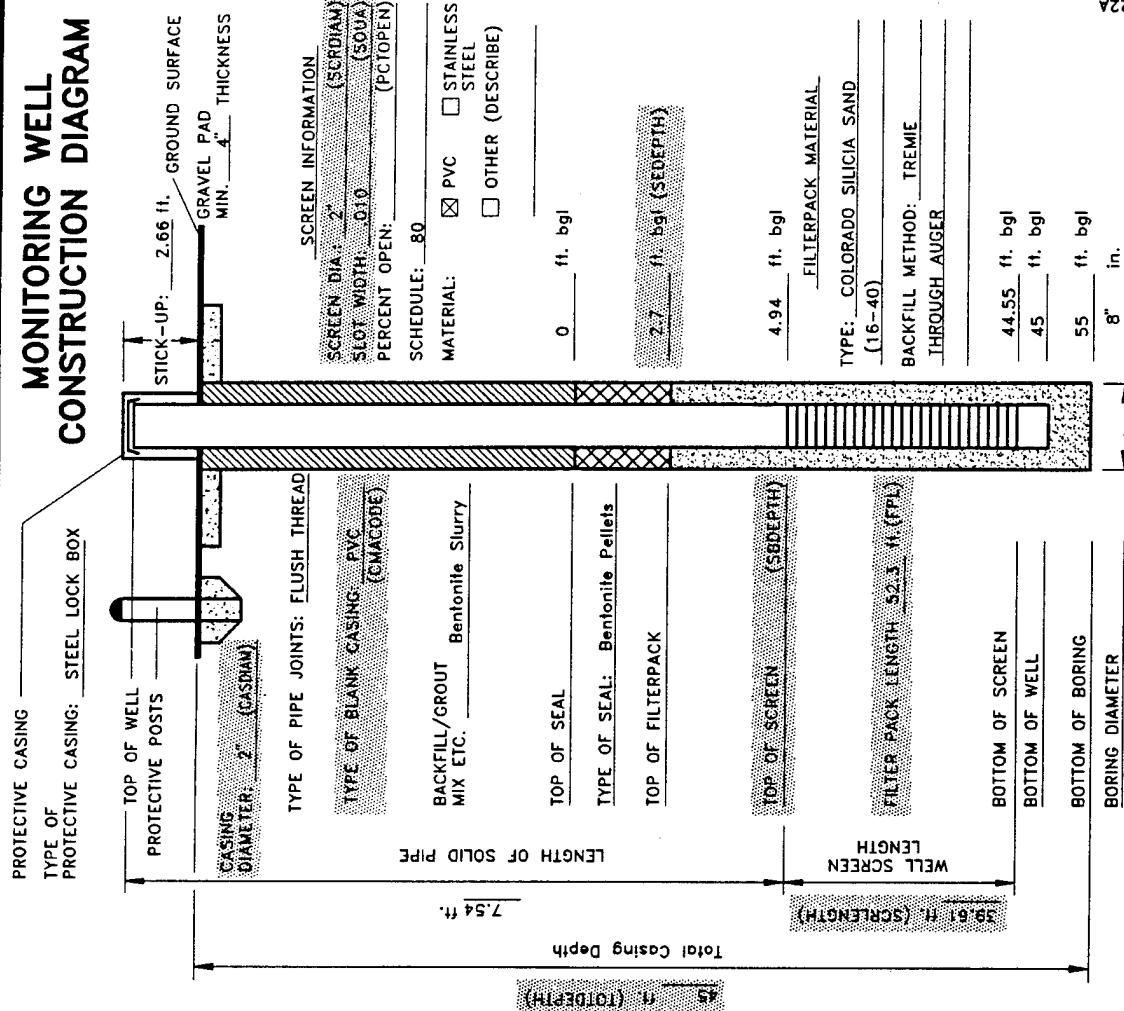
# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID) GALNA	Well I.D. (LOCID) 09-MW-04		
Well Owner (VVL WELCODE) USAF	Well Type (WL WTCODE) MNW		
Installer TAC	Date Started (INSDATE) 07/07/92	Date Completed 07/08/92	
Location Coordinates: (NCORD) (North) 3926073 (East) 1802387			
Elevation Top of Casing (MPELV) 145.49	Completion Method (VVL WCMCODE) GS		
Sole Source Aquifer Code (VVL SAQCODE) -			
Drilling Method HS	Completion Zone (VVL GZCODE) W		
Remarks (REMARKS)			

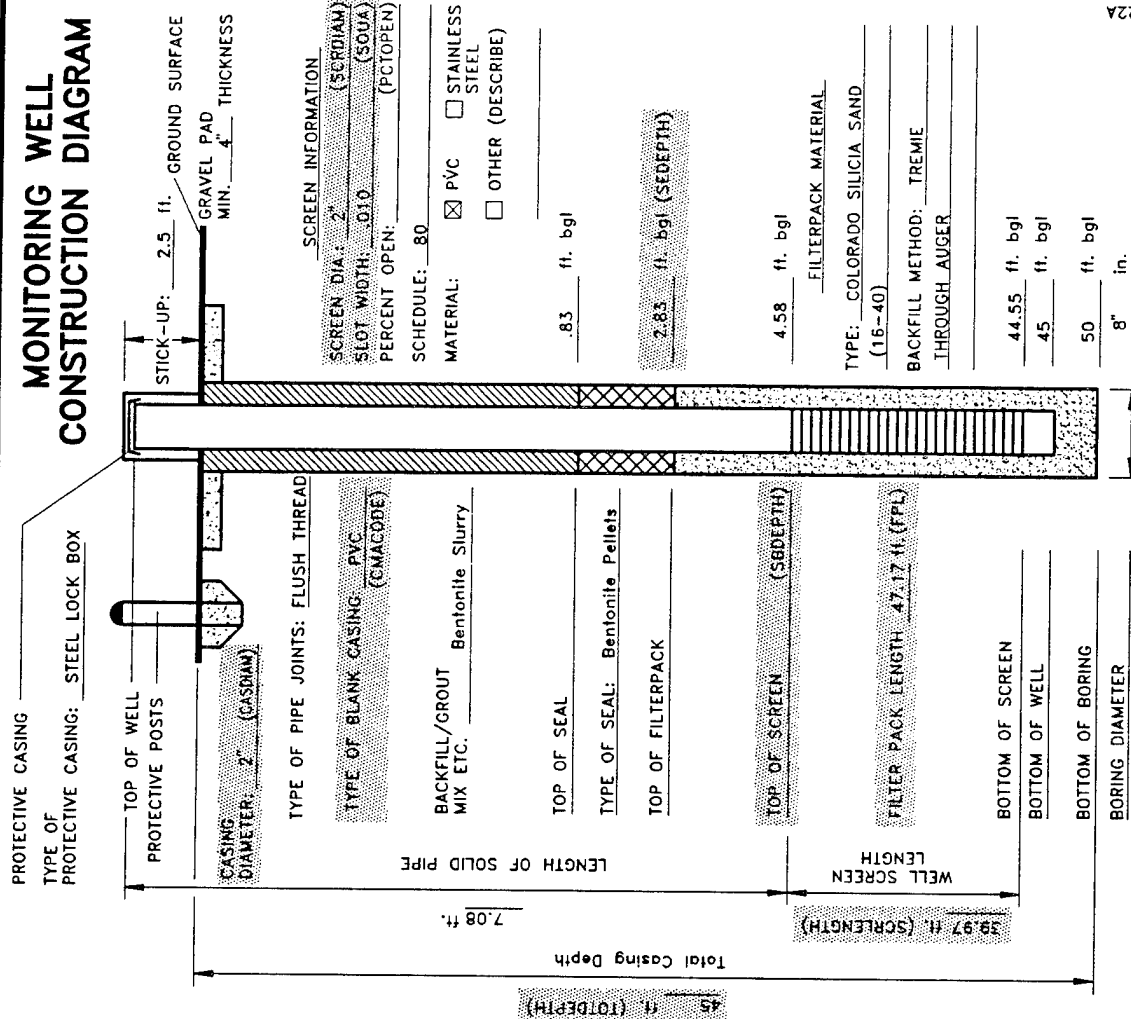
# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID) <b>GALNA</b>	Well I.D. (LOCID) <b>09-MW-05</b>		
Well Owner (VVL WELCODE) <b>USAF</b>	Well Type (VVL WTCODE) <b>MNW</b>		
Installer <b>RVP/TAC</b>	Date Started (INSDATE) <b>08/16/92</b>	Date Completed <b>08/16/92</b>	
Location Coordinates: (NCORD) (North) <b>3926630</b> (ECORD) (East) <b>1802495</b>			
Elevation Top of Casing (MPELV) <b>141.24</b>	Completion Method (VVL WCMCODE) <b>GS</b>		
Sole Source Aquifer Code (VVL SAQCODE) <b>-</b>			
Drilling Method <b>HS</b>	Completion Zone (VVL GZCODE) <b>W</b>		
Remarks (REMARKS)			

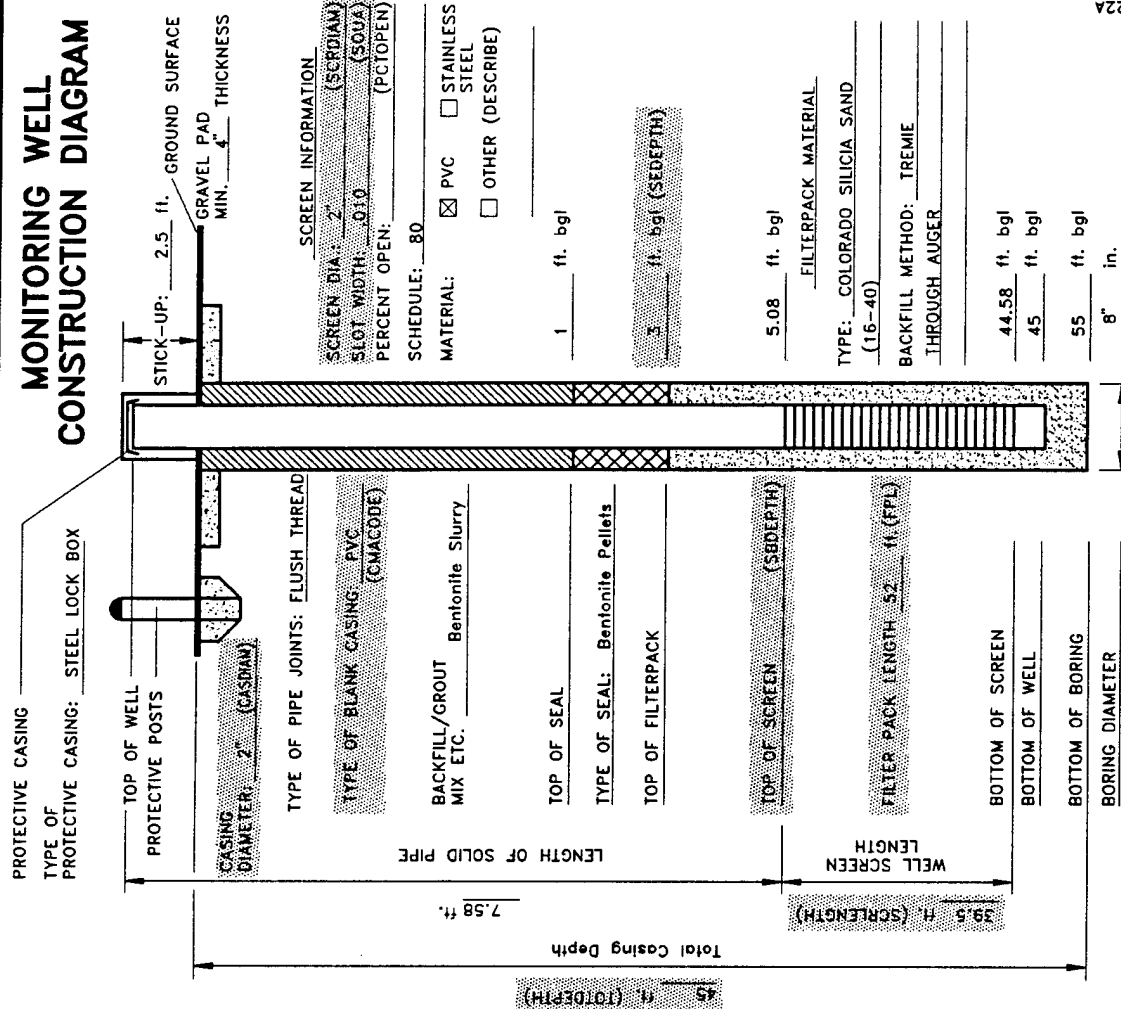
# **MONITORING WELL CONSTRUCTION DIAGRAM**



F3622A

Project (PROJID) GALNA	Well I.D. (LOCID) 09-MW-06		
Well Owner (VWL WELCODE) USAF	Well Type (WL WTCODE) MNV		
Installer PAC	Date Started (INSDATE) 08/17/92	Date Completed 08/17/92	
Location Coordinates: (NCORD) (North) 3926845 (ECORD) (East) 1802849			
Elevation Top of Casing (MPELV) 140.38	Completion Method (VWL WCMCODE) GS		
Sole Source Aquifer Code (VWL SAQCODE) -			
Drilling Method HS	Completion Zone (VWL GZCODE) W		
Remarks (REMARKS)			

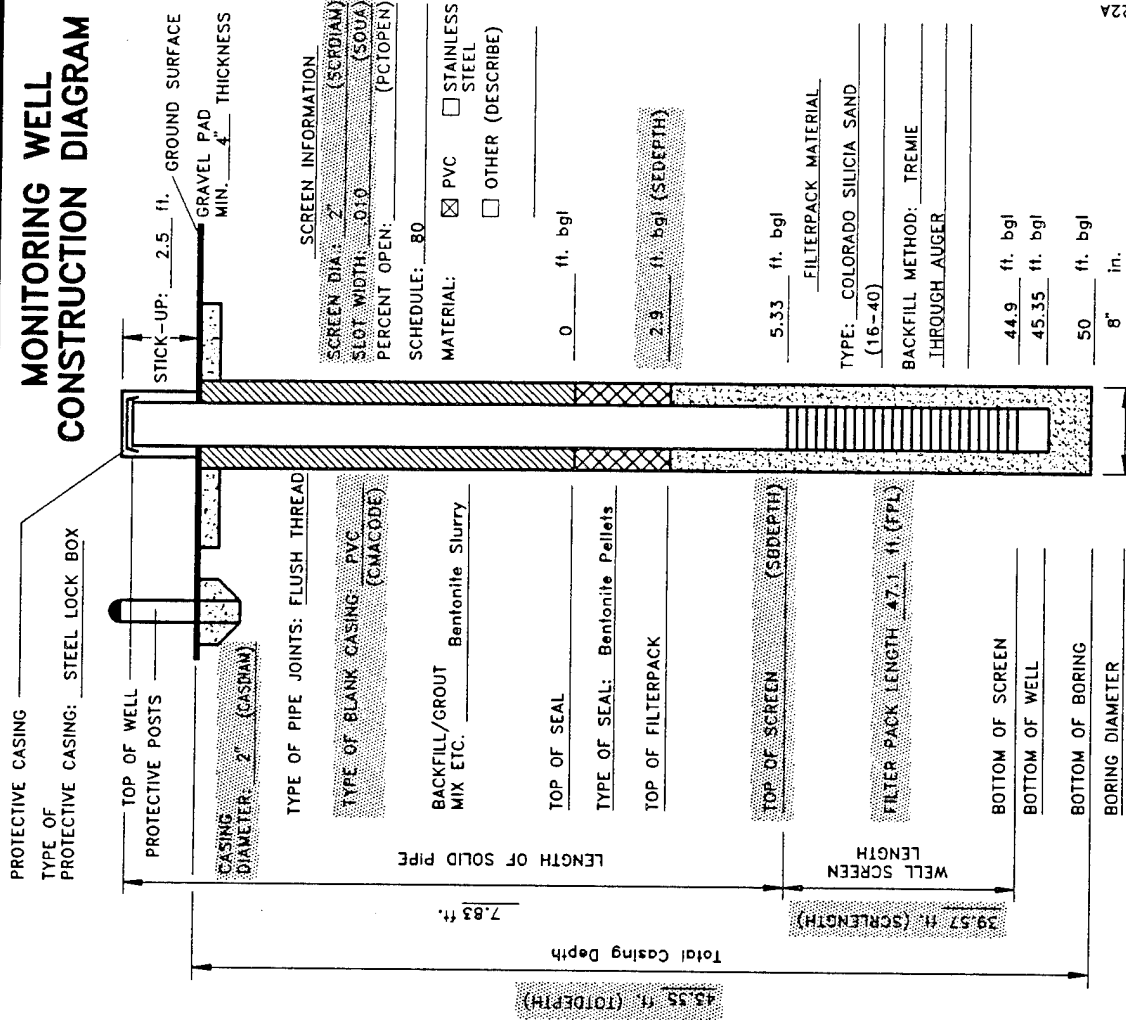
## MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID) GALNA	Well I.D. (LOCID) 10-MW-01		
Well Owner (VVL WELCODE) USAF	Well Type (VVL WTCODE) MNW		
Installer GSC	Date Started (INSDATE) 07/13/92	Date Completed 07/13/92	
Location Coordinates: (NCORD) (North) 3926165 (East) 1803467			
Elevation Top of Casing (MPELV) 144.3	Completion Method (VVL WCMCODE) GS		
Sole Source Aquifer Code (VVL SAQCODE) -			
Drilling Method HS	Completion Zone (VVL GZCODE) W		
Remarks (REMARKS)			

# MONITORING WELL CONSTRUCTION DIAGRAM



F3622A

Project (PROJID) GALNA	Well I.D. (LOCID) 10-MW-02		
Well Owner (VWL WELCODE) USAF	Well Type (WL WTCODE) MNW		
Installer GSC	Date Started (INSDATE) 07/12/92	Date Completed 07/12/92	
Location Coordinates: (NCORD) (North) 3925989 (ECORD) (East) 1803621			
Elevation Top of Casing (MPELV) 144.63	Completion Method (VWL WCMCODE) GS		
Sole Source Aquifer Code (VWL SAQCODE) -			
Drilling Method HS	Completion Zone (VWL GZCODE) W		
Remarks (REMARKS)			

# MONITORING WELL CONSTRUCTION DIAGRAM

PROTECTIVE CASING  
TYPE OF PROTECTIVE CASING: STEEL LOCK BOX

TOP OF WELL  
PROTECTIVE POSTS

CASING DIAMETER: 2" (GASDIA)

TYPE OF PIPE JOINTS: FLUSH THREAD

TYPE OF BLANK CASING: PVC (GMACODE)

BACKFILL/GROUT MIX ETC.: Bentonite Slurry

TOP OF SEAL

TYPE OF SEAL: Bentonite Pellets

TOP OF FILTERPACK

TOP OF SCREEN (SBDEPTH)

WELL SCREEN LENGTH

39.57 ft. (SCRENGTH)

BOTTOM OF SCREEN

BOTTOM OF WELL

BOTTOM OF BORING

BORING DIAMETER

45.35 ft. (TOTDEPTH)

Total Casing Depth

7.83 ft.

STICK-UP: 2.5 ft. GROUND SURFACE

GRAVEL PAD MIN. 4" THICKNESS

SCREEN INFORMATION

SCREEN DIA: 2" (SCRDIA)

SLOT WIDTH: 0.10 (SOW)

PERCENT OPEN: (PCOPEN)

SCHEDULE: 80

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

0 ft. bgl

2.9 ft. bgl (SEDEPTH)

5.33 ft. bgl

FILTERPACK MATERIAL

TYPE: COLORADO SILICIA SAND (16-40)

BACKFILL METHOD: TREMIE THROUGH AUGER

44.9 ft. bgl

45.35 ft. bgl

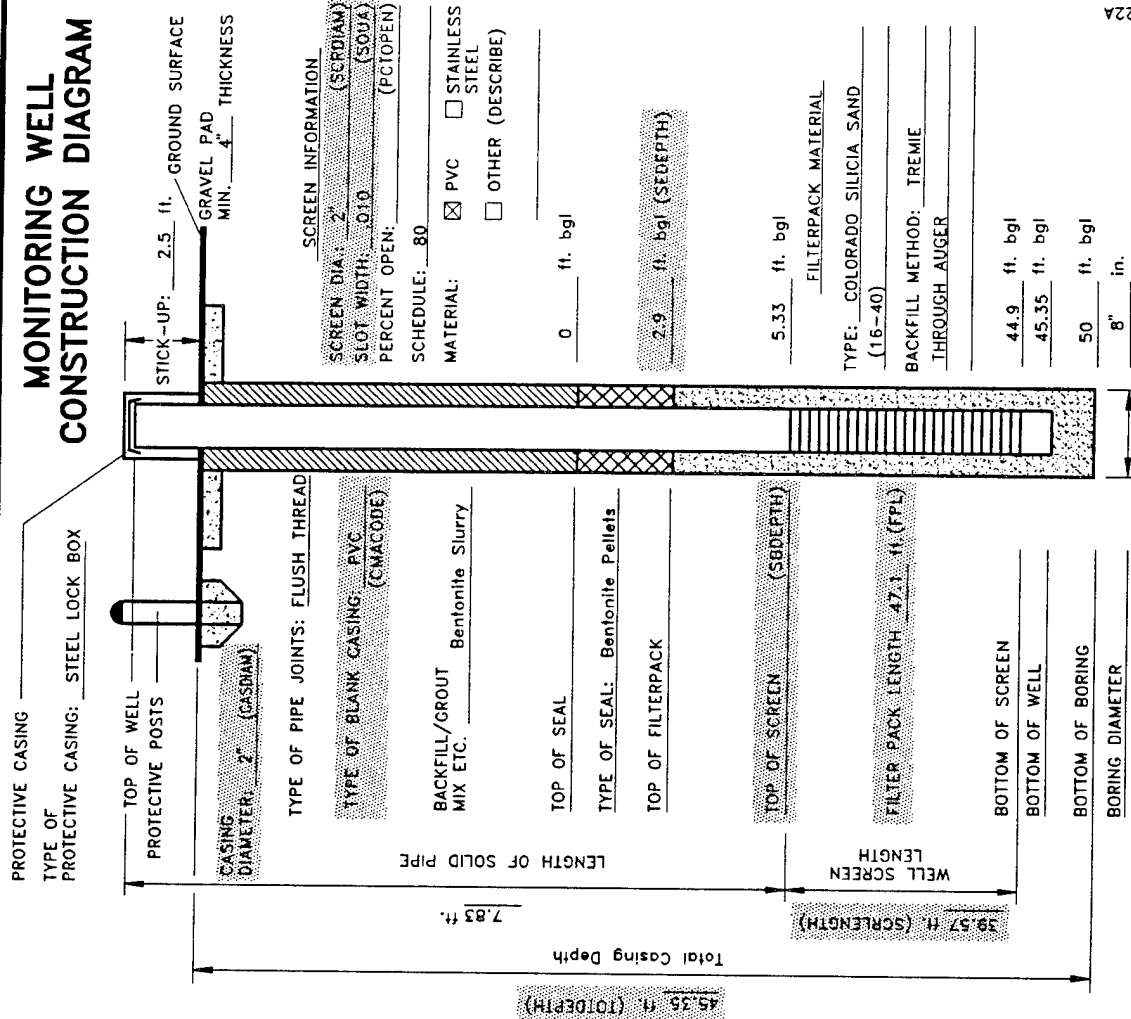
50 ft. bgl

8" in.

F3622A

Project (PROJID) GALNA	Well I.D. (LOCID) 10-MW-03		
Well Owner (VVL WELCODE) USAF	Well Type (WL WTCODE) MNW		
Installer GSC	Date Started (INSDATE) 07/11/92	Date Completed 07/11/92	
Location Coordinates: (NCORD) (North) 3925916 (East) 1803384			
Elevation Top of Casing (MPELV) 145	Completion Method (VVL WCMCODE) GS		
Sole Source Aquifer Code (VVL SAQCODE) —			
Drilling Method HS	Completion Zone (VVL GZCODE) W		
Remarks (REMARKS)			

# MONITORING WELL CONSTRUCTION DIAGRAM



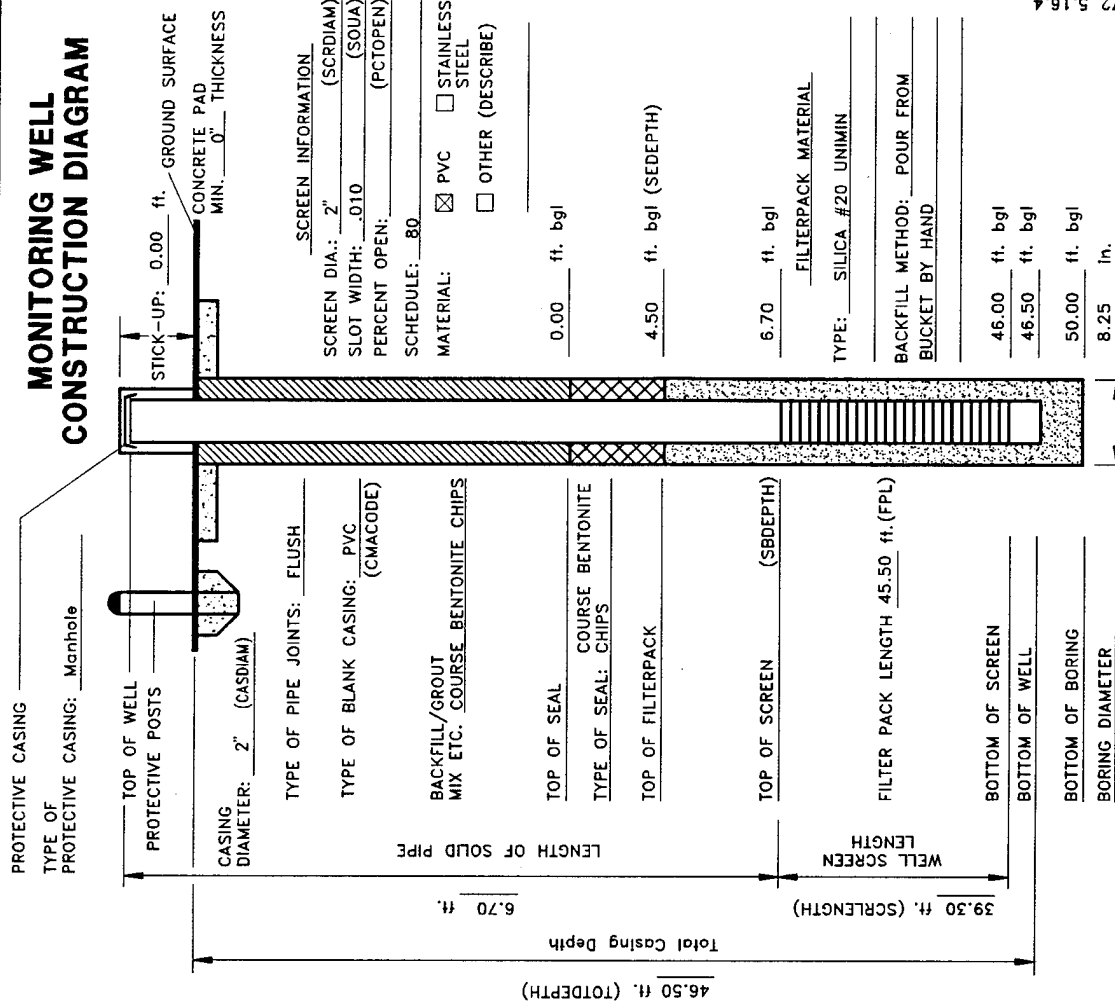
F3622A



**1993 Monitoring Well Construction Diagrams**

Air Force Base (VVL AFID)	Well I.D. (LOCID)		
GALNA	01-MW-07		
Well Owner (VVL WELCODE)	Well Type (WL WTCODE)		
USAF	MNW		
Installation Date (INDATE)	Date Started	Date Completed	
8/6/93	8/6/93	8/6/93	
Location Coordinates:			
(NCORD)	(ECORD)	1811069	
(North)	(East)		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
--	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Installer/Inspector	Date		
TAC	8/6/93		
Remarks (REMARKS)			
Located at Soil Gas Point E3. Downgradient of site. Stickup cut off after survey due to State DOT request. Elevation not resurveyed.			

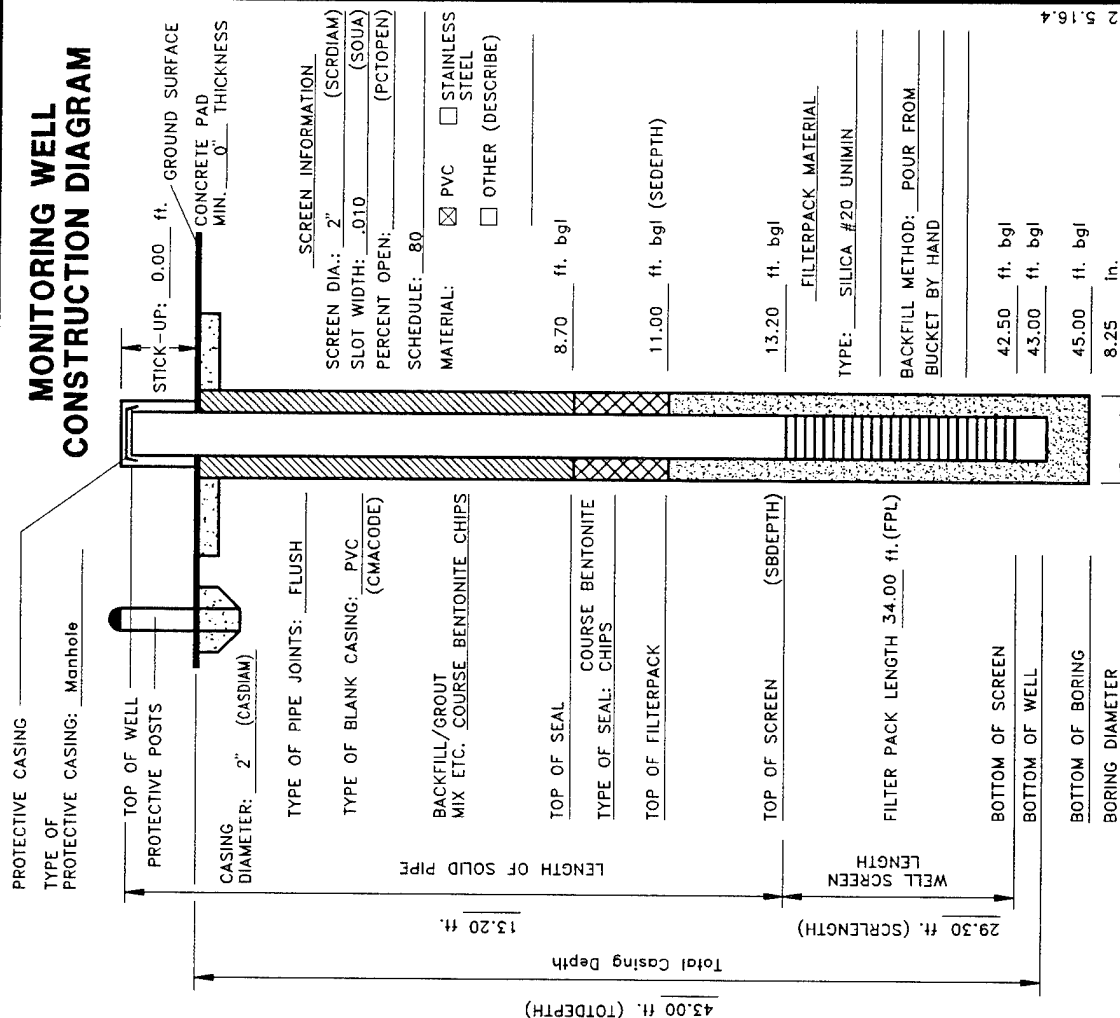
## MONITORING WELL CONSTRUCTION DIAGRAM



F4072 5.16.4

Air Force Base (VVL AFID)	Well I.D. (LOCID)		
GALNA	01-MW-08		
Well Owner (VVL WELCODE)	Well Type (WL WTCODE)		
USAF	MNV		
Installation Date (INDATE)	Date Started	Date Completed	
8/7/93	8/7/93	8/7/93	
Location Coordinates:			
(NCORD)	(ECORD)	1811266	
(North)	(East)		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
--	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Installer/Inspector	Date		
TAC	8/7/93		
Remarks (REMARKS)			
Located at Soil Gas Point E5 where FID measured 250 ppm in Soil Gas. Stick-up cut off after survey. Elevation of top of casing not reestablished.			

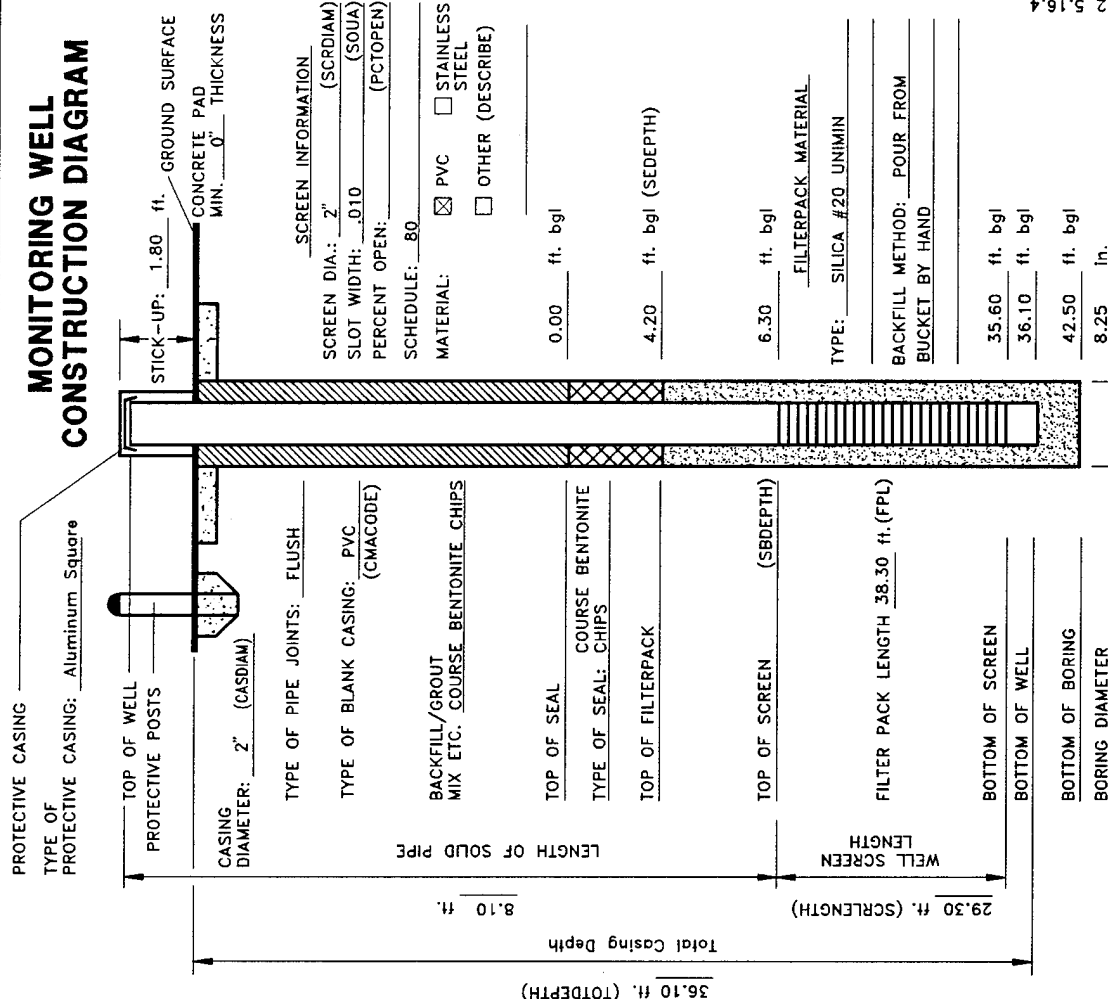
## MONITORING WELL CONSTRUCTION DIAGRAM



F4072 5.16.4

Air Force Base (VVL AFID)	Well I.D. (LOCID)		
GALNA	05-MW-13		
Well Owner (VVL WELCODE)	Well Type (WL WTCODE)		
USAF	MNV		
Installation Date (INDATE)	Date Started	Date Completed	
8/25/93	8/25/93	8/25/93	
Location Coordinates:			
(NCORD)	(ECORD)	1804190	
(North)	(East)		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
147.01	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Installer/Inspector	Date		
RVP	8/25/93		
Remarks (REMARKS)			
East of installation fence, near POL Building.			

## MONITORING WELL CONSTRUCTION DIAGRAM



F4072 5.16.4

Air Force Base (VVL AFID)	Well I.D. (LOCID)		
GALNA	05-MW-14		
Well Owner (VVL WELCODE)	Well Type (WL WTCODE)		
USAF	MNV		
Installation Date (INDATE)	Date Started	Date Completed	
8/27/93	8/27/93	8/27/93	
Location Coordinates:			
(NCORD)	(ECORD)	1801950	
(North)	(East)		
Elevation Top of Casing (WPELV)	Completion Method (VVL WCMCODE)		
142.05	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Installer/Inspector	Date		
RVP	8/28/93		
Remarks (REMARKS)			
On tarmac near private plane parking area.			

## MONITORING WELL CONSTRUCTION DIAGRAM

PROTECTIVE CASING  
TYPE OF PROTECTIVE CASING: Manhole

TOP OF WELL  
PROTECTIVE POSTS

CASING DIAMETER: 2" (CSDIAM)

TYPE OF PIPE JOINTS: FLUSH

TYPE OF BLANK CASING: PVC (CMACODE)

BACKFILL/GROUT MIX ETC. COURSE BENTONITE CHIPS

TOP OF SEAL  
COURSE BENTONITE  
TYPE OF SEAL: CHIPS

TOP OF FILTERPACK

TOP OF SCREEN (SBDEPTH)

FILTER PACK LENGTH 33.90 ft. (FPL)

WELL SCREEN LENGTH

29.30 ft. (SCRELENGTH)

35.30 ft. (TOTDEPTH)

5.50 ft.

STICK-UP: 0.00 ft. GROUND SURFACE

CONCRETE PAD MIN. 0" THICKNESS

SCREEN INFORMATION

SCREEN DIA.: 2" (SCRDIA)

SLOT WIDTH: .010 (SLOUA)

PERCENT OPEN: (PCTOPEN)

SCHEDULE: 80

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

0.00 ft. bgl

3.60 ft. bgl (SEDEPTH)

5.50 ft. bgl

FILTERPACK MATERIAL

TYPE: SILICA #20 UNIMIN

BACKFILL METHOD: POUR FROM BUCKET BY HAND

34.80 ft. bgl

35.30 ft. bgl

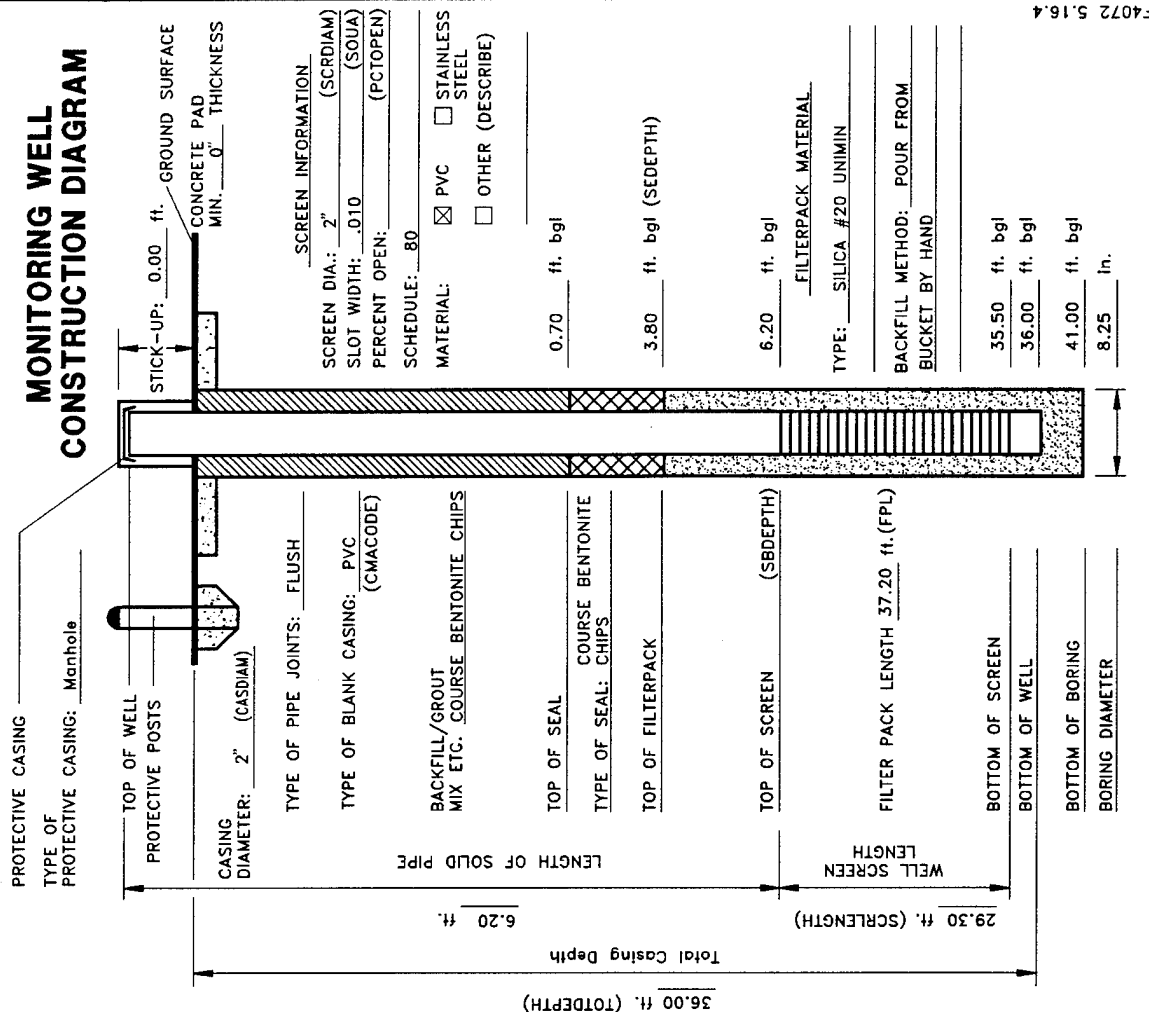
37.50 ft. bgl

8.25 in.

F4072 5.16.4

Air Force Base (VVL AFID)	Well I.D. (LOCID)		
GALNA	05-MW-15		
Well Owner (VVL WELCODE)	Well Type (WL WTCODE)		
USAF	MNV		
Installation Date (INDATE)	Date Started	Date Completed	
8/28/93	8/28/93	8/28/93	
Location Coordinates:			
(NCORD) 3925725 (North)	(ECORD) 1804487 (East)		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
143.34	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Installer/Inspector	Date		
RVP	8/28/93		
Remarks (REMARKS)			
On tarmac near flight services			

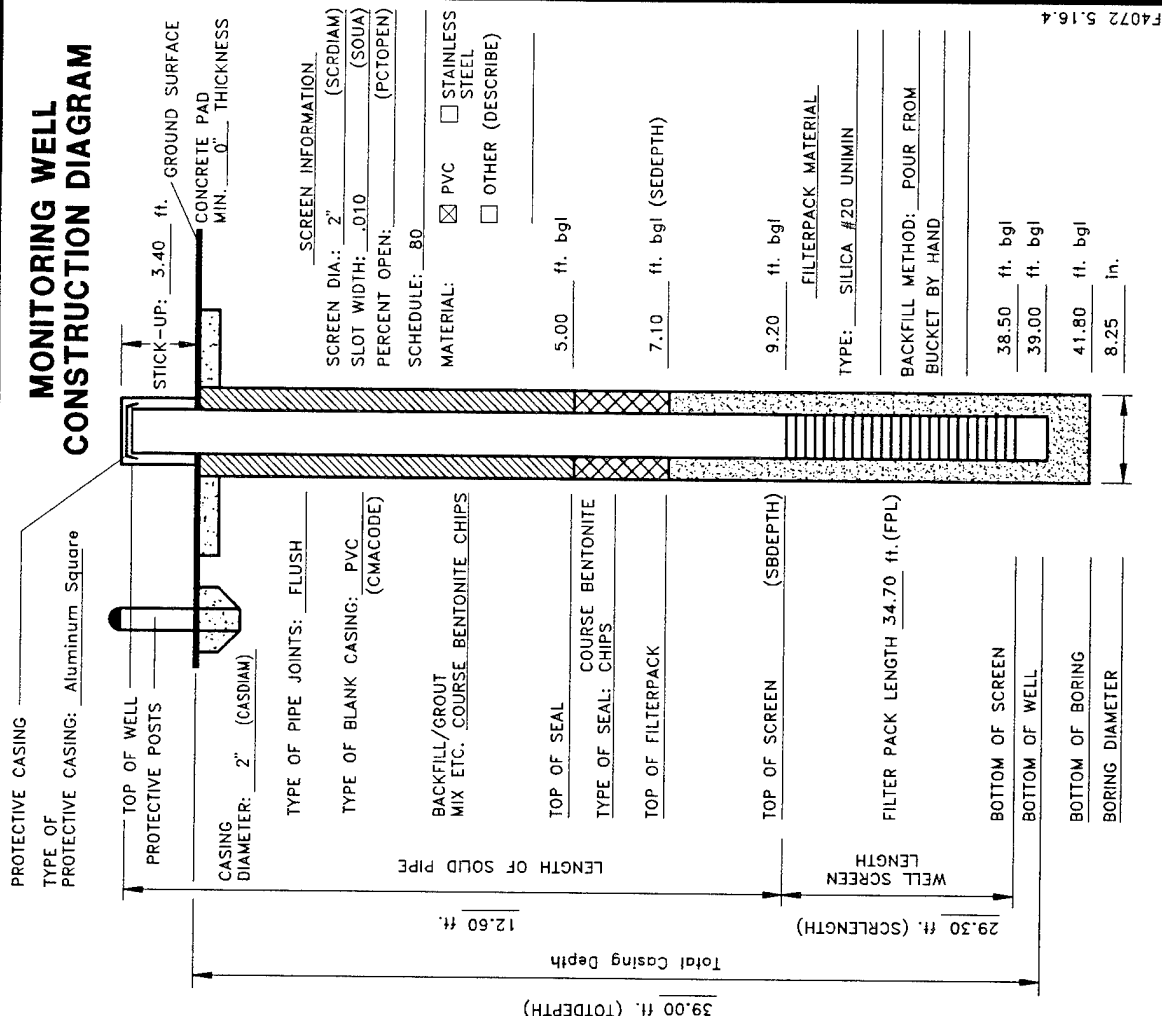
## MONITORING WELL CONSTRUCTION DIAGRAM



FA072 5.16.4

Air Force Base (VVL AFID)	Well I.D. (LOCID)		
GALNA	06-MW-07		
Well Owner (VVL WELCODE)	Well Type (WL WTCODE)		
USAF	MNV		
Installation Date (INDATE)	Date Started	Date Completed	
8/26/93	8/26/93	8/26/93	
Location Coordinates:			
(NCORD)	(ECORD)	1803826	
(North)	(East)		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
143.34	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Installer/Inspector	Date		
RVP	8/26/93		
Remarks (REMARKS)			
Across from old BLM housing			

## MONITORING WELL CONSTRUCTION DIAGRAM



Air Force Base (VVL AFID)	Well I.D. (LOCID)		
GALNA	09-MW-15		
Well Owner (VVL WELCODE)	Well Type (WL WTCODE)		
USAF	MNW		
Installation Date (INDATE)	Date Started	Date Completed	
8/24/93	8/24/93	8/24/93	
Location Coordinates:	(ECORD)	1802755	
(NCORD)	(North)		
Elevation Top of Casing (MPELV)	Completion Method (VVL WCMCODE)		
142.62	GS		
Sole Source Aquifer Code (VVL SAQCODE)			
Drilling Method	Completion Zone (VVL GZCODE)		
HS	W		
Installer/Inspector	Date		
RVP	8/24/93		
Remarks (REMARKS)			
North of west end of runway			

## MONITORING WELL CONSTRUCTION DIAGRAM

**PROTECTIVE CASING**  
TYPE OF PROTECTIVE CASING: Aluminum Square

**SCREEN INFORMATION**  
SCREEN DIA.: 2" (SCRDIA)  
SLOT WIDTH: .010 (SOJA)  
PERCENT OPEN:  (PCTOPEN)  
SCHEDULE: 80  
MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

**WELL CONSTRUCTION DATA**  
TOP OF WELL:   
PROTECTIVE POSTS:   
CASING DIAMETER: 2" (CSDIAM)  
TYPE OF PIPE JOINTS: FLUSH  
TYPE OF BLANK CASING: PVC (CMACODE)  
BACKFILL/GROUT MIX ETC. COURSE BENTONITE CHIPS  
TOP OF SEAL:   
TYPE OF SEAL: CHIPS  
TOP OF FILTERPACK:   
TOP OF SCREEN (SBDEPTH):   
FILTER PACK LENGTH 36.70 ft. (FPL)  
BOTTOM OF SCREEN:   
BOTTOM OF WELL:   
BOTTOM OF BORING:   
BORING DIAMETER:   
WELL SCREEN LENGTH:   
29.30 ft. (SCRENGTH)  
Total Casing Depth 35.20 ft. (TOTDEPTH)  
7.80 ft.  
LENGTH OF SOLID PIPE:   
0.00 ft. bgl  
3.30 ft. bgl (SEDEPTH)  
5.40 ft. bgl  
34.70 ft. bgl  
35.20 ft. bgl  
40.00 ft. bgl  
8.25 in.

**STICK-UP: 2.40 ft.**  
**GROUND SURFACE**  
**CONCRETE PAD MIN. 0" THICKNESS**

**BACKFILL METHOD: POUR FROM BUCKET BY HAND**

**SCREEN INFORMATION**  
SCREEN DIA.: 2" (SCRDIA)  
SLOT WIDTH: .010 (SOJA)  
PERCENT OPEN:  (PCTOPEN)  
SCHEDULE: 80  
MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

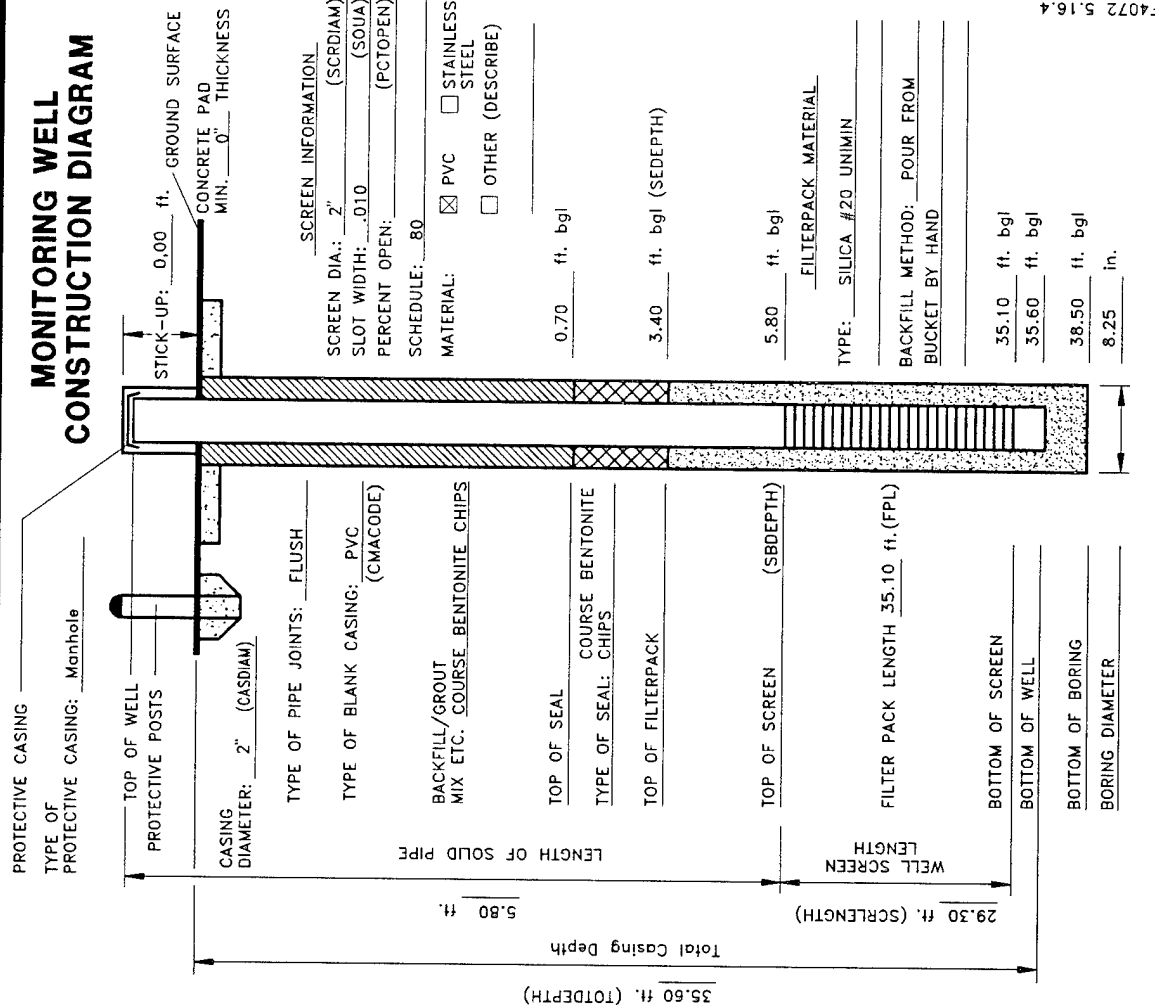
**FILTERPACK MATERIAL**  
TYPE: SILICA #20 UNIMIN

F4072 5.16.4



Air Force Base (VWL AFID)	Well I.D. (LOCID)	
GALNA	10-MW-04	
Well Owner (VWL WELCODE)	Well Type (WL WTCODE)	
USAF	MNV	
Installation Date (INDATE)	Date Started	Date Completed
8/29/93	8/29/93	8/29/93
Location Coordinates:		
(NCORD)	(ECORD)	1803251
(North)	(East)	
Elevation Top of Casing (MPELV)	Completion Method (VWL WCMCODE)	
143.05	GS	
Sole Source Aquifer Code (VWL SAQCODE)		
Drilling Method	Completion Zone (VWL GZCODE)	
HS	W	
Installer/Inspector	Date	
RVP	8/29/93	
Remarks (REMARKS)		
Southeast corner of CAC hanger		

## MONITORING WELL CONSTRUCTION DIAGRAM



F4072 5.16.4

**1992 Well Development Forms**

# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: GALENA AFS  
Client: \_\_\_\_\_

Well ID: Ø1-MW-Ø1  
Date: 20-AUG-92  
Time: 0910

Location: 01  
Weather: \_\_\_\_\_  
Supervisor: P. Caplan

Comments: \_\_\_\_\_

## Field Measurements

HNU/OVA Reading (ppm): Ø.5 ppm  
Water Depth (ft. btoc): 13.76  
Product Thickness (ft.): \_\_\_\_\_  
Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 49.56  
Saturated Thickness (ft.): 35.8  
5 well volumes (gal.): \_\_\_\_\_

Development Method: Waterra Inertial Pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
0900	—	—	—	—	—	13.76	Ø.5 ppm
0916	5	3.8	6.9	688			TURBID
0926	10	4.1	6.9	694			"
0933	15	2.6	6.9	668			"
0939	20	2.2	6.9	669			"
0949	25	3.2	6.9	691			"
0959	30	2.6	6.9	683			"
1009	35	2.6	6.6	667			Imoff 13ml/liter
1014	40	2.2	6.1	665			TURBID
1024	45	2.0	7.0	666			"
1029	50	2.3	6.9	672			"
1034	55	1.8	6.9	672			Mod Turbid
1045	60	2.3	7.0	436			" "
1050	65	2.1	6.8	634			Imoff = 15ml/liter
1057	70	1.9	6.9	627			Mod TURBID
1101	75	2.2	6.6	651			" "
1105	80	2.6	6.5	659			Less Turbin
1110	85	2.9	7.0	614			" "
1118	90	2.3	7.0	617		↓	" "
1124	95	2.2	6.9	617		13.81	" "
1125	96	—	—	—	—	—	Imoff = 6ml/liter

Final Measurements: 22 6.9 617 13.81

Total Volume Developed (gal.): 96  
Final Well Depth (ft. btoc): 49.95  
Photograph Number: \_\_\_\_\_

# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: GALENA AFS

Client:

Well ID: Ø1-MW-Ø2

Date: 8-19-92

Time: 1610

Location: (01)

Weather:

Supervisor: P. Coplan

Comments:

## Field Measurements

HNU/OVA Reading (ppm): 35.0

Water Depth (ft. btoc): 13.7 12.36

Product Thickness (ft.): —

Well Volume (gal.): —

Product Depth (ft. btoc): —

Well Depth (ft. btoc): 2953

Saturated Thickness (ft.): 17.17

5 well volumes (gal.): —

Development Method: Watterra Inertial Pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1604	—	—	—	—	—	12.36	35.0 ppm
1623	2	6.6	6.1	781	—	—	Very TURBID
1626	6	3.6	6.1	752	—	—	" "
1630	9	5.6	6.1	844	—	—	" "
1634	12	2.7	6.2	760	—	—	" "
1637	15	3.1	6.2	770	—	—	" "
1638	16	—	—	—	—	—	Imhoff 48 ml/liter
1640	18	2.7	6.3	755	—	—	TURBID
1641	21	2.6	6.3	756	—	—	" "
1644	24	3.2	6.4	751	—	—	" "
1646	27	2.5	6.5	760	—	—	" "
1652	30	4.8	6.5	777	—	—	" "
1653	31	—	—	—	—	—	Imhoff 13 ml/liter
1655	33	2.6	6.5	709	—	—	TURBID
1657	36	3.8	6.5	748	—	—	" "
1659	39	4.9	6.5	787	—	—	" "
1702	42	2.8	6.5	739	—	—	" "
1705	45	2.5	6.5	740	—	—	" "
1707	48	3.3	6.6	761	—	12.59	" "
1708	—	—	—	—	—	—	Imhoff 11 ml/liter

Final Measurements: 

33	6.6	761	12.59
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Total Volume Developed (gal.): 48 gal

Final Well Depth (ft. btoc): 29.83

Photograph Number: —

**RADIAN CORPORATION**

Location: Ambient Site (04)  
Weather:  
Supervisor: B. G. G. G.

## Field Measurements

Product Depth (ft. btoc): 1  
Well Depth (ft. btoc): 180  
Saturated Thickness (ft.): 7.16  
5 well volumes (gal.):

[illegible]

Total Volume Developed (gal.): 21  
Final Well Depth (ft. btoc): 1194  
Photograph Number:

**RADIAN**  
CORPORATION

**Client:**

Location: Ambient Site (04)  
Weather: \_\_\_\_\_  
Supervisor: P. P. P.

Comments: Temp. of pond of standing water 77' North of Well = 18°C.

HNU/OVA Reading (ppm): 2.0  
Water Depth (ft. btoc): 9.79  
Product Thickness (ft.): —  
Well Volume (gal.):

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 27.94  
Saturated Thickness (ft.): 13.15  
5 well volumes (gal.): \_\_\_\_\_

Development Method: Waterra Inertial pump

[illegible]

Final Measurements: 

36	13.8	7.0	62.7	99.5
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Total Volume Developed (gal.): 36.91  
Final Well Depth (ft. btoc): 52.93  
Photograph Number: \_\_\_\_\_

## MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATIONProject: galena afs  
Client: galena afsWell ID: 05 mw 01  
Date: 8/29/92  
Time: 1120Location: 05  
Weather: Cool and rainy  
Supervisor: B. Coel

Comments:

Field MeasurementsHNU/OVA Reading (ppm):  
Water Depth (ft. btoc): 20.23  
Product Thickness (ft.):  
Well Volume (gal.):Product Depth (ft. btoc):  
Well Depth (ft. btoc): 53.90  
Saturated Thickness (ft.): 33.67  
5 well volumes (gal.):Development Method: Waterra Inertial pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1102	-	-	-	-		20.23	1.0 ppm
1123	5	3.8	8.7	6109			turbid
1129	10	3.0	8.5	6104			"
1132	15	3.0	8.3	672			"
1143	20	3.5	8.1	680			"
1148	25	2.9	7.3	679			"
1153	30	3.1	6.7	679			" Imoff .25ml
1157	35	2.5	6.4	671			"
1201	40	2.4	6.2	678			"
1206	45	2.6	6.6	684			"
1212	50	2.7	6.9	672			"
1221	55	3.3	9.1*	641			"
1230	60	3.5	9.0	640			" Imoff 1.0ml
1235	65	2.7	8.8	633			"
1239	70	2.6	8.4	661			"
1245	75	2.8	6.0	658			"
1250	80	2.4	5.2	663			clearing
1254	85	2.6	4.7	659			"
1258	90	2.6	4.8	659		20.29	" Imoff .05ml
							"
							"
							"
							"
* PH meter questionable							"

Final Measurements: 

2.6	4.8	659	20.29
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Total Volume Developed (gal.): 90  
Final Well Depth (ft. btoc): 53.88  
Photograph Number: \_\_\_\_\_

# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: galena afs  
Client:

Well ID: 05 mw 02  
Date: 28 Aug 92  
Time: 1510

Location: 05  
Weather: cool + cloudy, clearing in afternoon  
Supervisor: B. Coel

Comments:

## Field Measurements

HNU/OVA Reading (ppm): 249  
Water Depth (ft. btoc): 19.21  
Product Thickness (ft.):  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 53.47  
Saturated Thickness (ft.): 34.26  
5 well volumes (gal.):

Development Method: waterma Inertial pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1500	-	-	-	-		19.21	0.0 ppm Ovm
1523	5	3.5	7.0	473			turbid
1529	10	3.1	6.0	488			"
1533	15	2.4	4.2	493			"
1539	20	2.5	4.7	491			"
1547	25	2.4	5.9	490			"
1551	30	2.4	6.3	493			"
1601	35	3.0	6.6	467			Imoff = 4ml
1606	40	3.2	6.7	476			clearing
1610	45	2.3	5.2	482			turbid
1616	50	2.4	6.9	474			"
1619	55	2.5	5.3	492			clearing
1625	60	3.2	6.3	498			"
1628	65	2.4	4.5	485			"
1630	70	2.1	5.1	485			Imoff: 2ml
1635	75	2.2	5.2	482			clearing
1640	80	2.5	5.1	486			lightly turbid
1646	85	2.4	5.9	480			"
1650	90	2.3	5.4	483			"
							Imoff = 1.75ml

Final Measurements: 2.3 5.4 483

Total Volume Developed (gal.): 90  
Final Well Depth (ft. btoc): 53.42  
Photograph Number:



## MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATIONProject: galena Afs  
Client:Well ID: 05 mw 03  
Date: 30 Aug 92  
Time: 1515Location: 05  
Weather: COOL and RAINY  
Supervisor: B. Coe

Comments:

Field MeasurementsHNU/OVA Reading (ppm): \_\_\_\_\_  
Water Depth (ft. btoc): 17.74  
Product Thickness (ft.): \_\_\_\_\_  
Well Volume (gal.): \_\_\_\_\_Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 53.74  
Saturated Thickness (ft.): 36.00  
5 well volumes (gal.): \_\_\_\_\_Development Method: Watera Inertial pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1454	-	-	-	-		17.74	360 ppm
1518	5	5.4	7.4	672			turbid
1522	10	3.8	7.1	651			"
1533	15	3.8	7.1	663			"
1540	20	3.8	7.0	670			"
1549	25	3.6	6.4	667			"
1554	30	3.6	6.2	666			" Imhoff 3ml/liter
1602	35	3.4	5.4	683			clearing
1606	40	3.3	5.1	662			"
1610	45	3.7	5.4	670			"
1615	50	3.2	6.3	668			"
1621	55	3.4	6.5	667			"
1627	60	3.1	6.9	662			" Imhoff 3.5ml/liter
1630	65	3.1	6.5	664			"
1634	70	3.3	6.5	668			"
1639	75	3.0	6.7	664			"
1642	80	2.7	5.8	668			"
1645	85	3.0	5.6	665			"
1649	90	3.1	6.0	668		17.77	" Imhoff 2ml/liter

Final Measurements: 

3.1	6.0	668	17.77
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Total Volume Developed (gal.): 90  
Final Well Depth (ft. btoc): 53.74  
Photograph Number: \_\_\_\_\_

# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: galena afs  
Client:

Well ID: 05 mw04  
Date: 29 Aug 92  
Time: 0850

Location: 05  
Weather: cool and rainy  
Supervisor: B. Coel

Comments:

## Field Measurements

HNU/OVA Reading (ppm):  
Water Depth (ft. btoc): 15.48  
Product Thickness (ft.):  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 49.34  
Saturated Thickness (ft.): 33.86  
5 well volumes (gal.):

Development Method: Waterra Inertial pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
0836	-	-	-	-		15.48	216.0ppm - 0.082
0853	5	3.1	7.9	833			turbid
0859	10	2.5	6.1	810			"
0906	15	2.4	7.1	800			"
0914	20	2.6	7.1	795			"
0922	25	2.3	7.5	777			"
0928	30	2.2	6.9	789			Imoff 21ml
0934	35	2.4	7.1	783			Turbid
0942	40	1.8	7.7	771			"
0949	45	1.9	7.3	778			"
0954	50	1.9	7.7	784			"
0958	55	1.8	7.7	782			"
1005	60	1.8	7.9	784			Imoff 7ml
1012	65	2.2	8.8	759			turbid
1016	70	1.9	8.7	760			"
1020	75	2.2	8.6	782			"
1025	80	2.1	8.6	780			"
1029	85	2.0	8.6	783			"
1039	90	2.3	8.5	796		15.48	Imoff 3ml

Final Measurements: 

2.3	8.5	796	15.48
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Total Volume Developed (gal.): 90  
Final Well Depth (ft. btoc): 49.20  
Photograph Number:

# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: galena afs  
Client:

Well ID: 05 mw 05  
Date: 28 Aug 92  
Time: 1730

Location: 05  
Weather: clear and cloudy, clearing in after-noon  
Supervisor: B. Coel

Comments:

## Field Measurements

HNU/OVA Reading (ppm):  
Water Depth (ft. btoc): 116.82  
Product Thickness (ft.):  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 49.74  
Saturated Thickness (ft.): 32.92  
5 well volumes (gal.):

Development Method: watera Inertial pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1717	-	-	-	-		116.82	123.0 ppm
1733	5	3.9	6.7	8108			very turbid
1735	10	2.6	6.7	8106			" "
1740	15	2.8	5.7	8117			" "
1745	20	2.5	4.8	8116			" "
1747	25	2.7	5.1	889			" "
1753	30	2.8	5.7	8109			Imoff - 7.5ml
1757	35	2.7	5.4	863			very turbid
1802	40	2.7	5.6	865			" "
1806	45	2.4	5.5	859			" "
1809	50	2.0	5.2	861			" "
1820	55	5.1	7.2	867			" "
1825	60	3.0	7.2	816			Imoff 8ml
1830	65	2.6	7.1	808			turbid
1835	70	3.2	6.7	838			"
1840	75	2.5	6.6	850			"
1845	80	2.6	6.3	850			Light
1849	85	2.8	6.0	857			"
1854	90	2.5	6.4	837			Imoff 3.5ml

Final Measurements: 2.5 6.4 837

Total Volume Developed (gal.): 90  
Final Well Depth (ft. btoc): 49.68  
Photograph Number:

# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: galena afs  
Client:

Well ID: 05 mw 010  
Date: 28 Aug 92  
Time: 2140

Location: 05  
Weather: cool and cloudy, clearing afterno  
Supervisor: B. Coel

Comments:

## Field Measurements

HNU/OVA Reading (ppm):  
Water Depth (ft. btoc): 13.21  
Product Thickness (ft.):  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 41.81  
Saturated Thickness (ft.): 28.60  
5 well volumes (gal.):

Development Method: waterma Inertial Pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
2131	-	-	-	-		13.21	00 ppm
2143	5	5.5	7.0	728			turbid
2146	10	4.5	6.2	728			"
2148	15	4.4	5.9	732			"
2153	20	4.2	4.7	758			"
2156	25	4.1	3.7	748			clearing
2200	30	4.1	2.8*	747			Imoff - 1ml
2208	35	4.3	3.2	748			clearing
2211	40	4.0	3.1	743			"
2216	45	4.3	4.2	744			"
2226	50	4.6	4.9	736			"
2234	55	4.5	5.3	737			"
2240	60	4.1	4.8	747			Imoff - 0.5ml
2245	65	4.1	4.5	739			clearing
2250	70	4.3	4.1	742			"
2254	75	4.1	4.3	738			"
2300	80	4.1	4.5	735			"
2304	85	3.9	5.2	741			"
2307	90	4.9	6.2	439		11.24	Imoff - 2ml

\* operation of PH probe very questionable

Final Measurements: 4.9 6.2 439 11.24

Total Volume Developed (gal.): 90  
Final Well Depth (ft. btoc): 48.67  
Photograph Number:

# MONITORING WELL DEVELOPMENT LOG



Project: GALERIA AFS  
Client:

Well ID: 20-MW-03  
Date: 18 AUG 92  
Time: 10:05

Location: Waste Accumulation AREA (06)  
Weather:  
Supervisor: P. CopeLAN

Comments:

## Field Measurements

HNU/OVA Reading (ppm): 0.0  
Water Depth (ft. btoc): 13.42  
Product Thickness (ft.): —  
Well Volume (gal.):

Product Depth (ft. btoc): —  
Well Depth (ft. btoc): 48.71  
Saturated Thickness (ft.): 35.29  
5 well volumes (gal.):

Development Method: Waterma Inertial Pump

Time	Cum. Vol. (gal.)	Water Quality Correl			pH	Turb	Water Level	Comments
		Temp.	-pH 3	-Cond.				
1041	0	—	—	—	—	—	13.42	NO OVA READINGS
1045	5	5.4	673	6.7				TURBID
1048	10	4.8	681	6.7				"
1050	15	4.7	679	6.6				"
1051	20	4.7	678	6.4				"
1054	25	4.8	678	6.3				"
1057	30	4.7	676	6.3				"
1100	35	4.8	679	6.3				Temp = 20.0 mph water
1102	40	4.9	677	6.3				TURBID
1112	45	4.8	675	6.4				"
1121	50	4.8	671	6.5				"
1123	55	4.7	670	6.3				"
1123								LUNK
1318								RETURN
1323	60	5.1	656	6.6				Temp Cone - 7.0 mph water
1327	65	4.9	676	6.4				TURBID
1334	70	4.9	683	6.4				"
1337	75	4.8	684	6.3				"
1339	80	4.8	682	6.2				"
1342	85	5.2	656	6.6				"
1345	90	4.9	657	6.5				"
1347	95	4.9	671	6.5				LIN TUR.
1351	110	5.3	672	6.6			13.32	Temp = 2.5 mph water

Final Measurements: 110 gal 5.3 6.6 mph 672 mph

Total Volume Developed (gal.): 110 ft  
Final Well Depth (ft. btoc): 48.70  
Photograph Number:

**RADIAN CORPORATION**

Location: 07  
Weather: \_\_\_\_\_  
Supervisor: P. Coplen

## Field Measurements

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 15.24  
Saturated Thickness (ft.): 11.31  
5 well volumes (gal.): \_\_\_\_\_

[illegible]

Total Volume Developed (gal.): 30  
Final Well Depth (ft. btoc): 14.78  
Photograph Number: \_\_\_\_\_

**RADIAN**  
ENERGIZATION

Location: Campion (07)  
Weather: \_\_\_\_\_  
Supervisor: P Coplan

## Field Measurements

Product Depth (ft. btoc):           —            
Well Depth (ft. btoc): 22.74  
Saturated Thickness (ft.): 19.84  
5 well volumes (gal.):                                 

[illegible]

Total Volume Developed (gal.): 55  
Final Well Depth (ft. btoc): 22.62  
Photograph Number: \_\_\_\_\_

**RADIAN**  
CORPORATION

Location: 07  
Weather:  
Supervisor: P. Copley

**Comments:**

## Field Measurements

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 17.06  
Saturated Thickness (ft.): 13.92  
5 well volumes (gal.): \_\_\_\_\_

Development Method: Waterma Inertial pump

[illegible]

Final Measurements: 

2.0	4.8	715		3.600
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Total Volume Developed (gal.): 38  
Final Well Depth (ft. btoc): 17.12  
Photograph Number: \_\_\_\_\_



# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: galena afs  
Client:

Well ID: 07 mw 04  
Date: 20 AUG 92 - 21 AUG 92  
Time: 1725

Location: 07  
Weather:  
Supervisor: P. Copley

Comments:

## Field Measurements

HNU/OVA Reading (ppm): 249  
Water Depth (ft. btoc): 21.35  
Product Thickness (ft.):  
Well Volume (gal.): 5.4

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 55.08  
Saturated Thickness (ft.): 33.73  
5 well volumes (gal.): 27.00

Development Method: watera Inertial pump

	Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
			Temp.	pH	Cond	Turb		
8-20	1725	-	-	-	-		21.35	0.2 ppm
	1750	5	3.8	7.9	656			very turbid
	1754	10	2.6	13.4	625			" "
	1757	15	2.1	11.7	621			Imhoff 04.5 ml/liter
	1806	20	3.1	13.2	666			" "
	1823	25	2.3	15.8	645			" "
	1830	30	3.2	6.9	668			Imhoff
	1837	35	3.9	7.2	688			" "
	1841	40	2.9	7.2	665			" "
	1843	45	3.7	7.1	679			" "
	1853	50	3.6	7.2	649			" "
	1901	55	3.0	7.1	655			Imhoff 29 ml/liter stop fo
8-21	1421	60	6.2	7.0	736			mod turbid
	1428	65	5.4	7.2	717			" "
	1528	70	2.7	7.2	669			" "
	1545	75	3.5	7.2	699			" "
	1601	80	3.7	7.2	705			" "
	1611	85	3.6	7.2	697			turbid
	1619	90	3.3	7.2	685			" Imhoff 8 ml/liter

Final Measurements: 3.3 7.2 685

Total Volume Developed (gal.): 90  
Final Well Depth (ft. btoc):  
Photograph Number:

# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: galena af3  
Client: \_\_\_\_\_

Well ID: 09 mw 01  
Date: 8/22/92  
Time: 1055

Location: 09  
Weather: \_\_\_\_\_  
Supervisor: P. Coplen

Comments: \_\_\_\_\_

## Field Measurements

HNU/OVA Reading (ppm): \_\_\_\_\_  
Water Depth (ft. btoc): 12.03  
Product Thickness (ft.): \_\_\_\_\_  
Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 47.64  
Saturated Thickness (ft.): 38.61  
5 well volumes (gal.): \_\_\_\_\_

Development Method: Waterma Inertial pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1645	-	-	-	-		12.03	0.0 ppm
1702	5	7.0	6.6	696			turbid
1705	10	5.8	6.6	694			"
1709	15	5.4	6.6	709			"
1711	20	5.2	6.6	728			"
1715	25	5.2	6.9	735			"
1717	30	5.6	6.7	734			" Imhoff 3.5ml/liter
1722	35	5.2	7.0	732			"
1726	40	5.4	7.0	739			"
1731	45	5.8	7.0	703			"
1733	50	5.6	7.0	701			"
1739	55	5.7	7.0	704			"
1743	60	5.5	7.0	710			" Imhoff 4.5ml/liter
1749	65	5.8	7.1	673			"
1753	70	5.5	7.1	675			Clearing
1756	75	5.4	7.0	703			"
1802	80	5.6	7.1	682			"
1809	85	5.4	7.0	654			Clearing
1810	90	5.4	7.0	666			"
1814	95	5.6	7.0	693		12.16	" Imhoff 1.5ml/liter
1814	end purge						

Final Measurements: 

5.6	70	693	12.16
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Total Volume Developed (gal.): 95  
Final Well Depth (ft. btoc): 47.66  
Photograph Number: \_\_\_\_\_

# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: galena afs  
Client: \_\_\_\_\_

Well ID: 09 mw 03  
Date: 24 Aug 92  
Time: 1325

Location: 09  
Weather: warm and sunny  
Supervisor: B. Coe

Comments: \_\_\_\_\_

## Field Measurements

HNU/OVA Reading (ppm): \_\_\_\_\_  
Water Depth (ft. btoc): 13.32  
Product Thickness (ft.): \_\_\_\_\_  
Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 47.53  
Saturated Thickness (ft.): 34.21  
5 well volumes (gal.): \_\_\_\_\_

Development Method: Waterra Inertial pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1200	-	-	-	-		13.32	0.0 ppm
1330	5	5.8	7.9	583			turbid
1334	10	4.5	8.0	500			"
1344	15	4.1	8.2	577			"
1448	20	3.6	8.4	501			"
1355	25	5.0	8.0	576			"
1403	30	6.2	8.7	595			" Imhoff 1cm/liter
1411	35	5.3	8.7	549			"
1424	40	5.3	8.8	549			"
1434	45	5.9	8.8	562			"
1442	50	5.0	8.9	548			"
1451	55	4.4	8.9	555			"
1455	60	4.0	8.8	558			" Imhoff 4ml/liter
1505	65	5.2	8.8	581			"
1509	70	4.3	8.7	567			"
1513	75	4.1	7.3	563			"
1521	80	4.1	8.2	554			"
1523	85	4.2	7.7	566			"
1529	90	3.6	7.8	552		13.37	Lightly turbid Imhoff .65ml/l

Final Measurements: 3.10 7.8 552 13.37

Total Volume Developed (gal.): 90  
Final Well Depth (ft. btoc): 47.24  
Photograph Number: \_\_\_\_\_

# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: galena AFS  
Client:

Well ID: 09 mw 04  
Date: 8/23/92  
Time: 1416

Location: 09  
Weather:  
Supervisor: B. Coel

Comments:

## Field Measurements

HNU/OVA Reading (ppm):  
Water Depth (ft. btoc): 15.12  
Product Thickness (ft.):  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 47.53  
Saturated Thickness (ft.): 32.41  
5 well volumes (gal.):

Development Method: waterma Inertial pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1416	-	-	-	-		15.12	0.0ppm
1430	5	10.1	6.8	485			Turbid
1447	10	7.2	6.9	688			"
1450	15	5.7	6.9	687			"
1502	20	5.2	7.6	707			"
1510	25	4.9	8.2	722			"
1518	30	4.6	8.3	711			" Imhoff 25ml/liter
1523	35	4.6	8.4	705			"
1529	40	4.5	8.6	698			"
1535	45	5.4	7.9	710			"
1542	50	4.8	8.8	661			"
1546	55	4.8	8.6	689			"
1554	60	5.5	8.7	677			" Imhoff 6ml/liter
1600	65	4.8	8.7	675			"
1605	70	4.1	8.0	699			"
1607	75	3.8	8.0	698			"
1610	80	4.0	8.2	697			Lightly turbid
1616	85	4.3	8.1	692			"
1618	90	4.2	8.1	686		15.16	" Imhoff 2.25ml/liter

Final Measurements: 4.2 8.1 686 15.16

Total Volume Developed (gal.): 90  
Final Well Depth (ft. btoc): 47.44  
Photograph Number:

## MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATIONProject: gavena afs  
Client: \_\_\_\_\_Well ID: 09 mw 05  
Date: 27 Aug 92  
Time: 1550Location: 09  
Weather: Cold and Cloudy  
Supervisor: B. Coel

Comments: \_\_\_\_\_

Field MeasurementsHNU/OVA Reading (ppm): 249  
Water Depth (ft. btoc): 11.07  
Product Thickness (ft.): \_\_\_\_\_  
Well Volume (gal.): \_\_\_\_\_Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 47.46  
Saturated Thickness (ft.): 36.39  
5 well volumes (gal.): \_\_\_\_\_Development Method: Water Inertial pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1520	-	-	-	-		11.07	0.0 ppm OVM
1600	5	4.1	6.4	575			turbid
1604	10	3.3	5.7	601			"
1610	15	3.3	6.4	599			"
1619	25	3.3	7.2	572			"
1622	30	3.0	6.4	592			Imoff 1.5ml
1627	35	3.1	7.0	591			turbid
1633	40	3.2	7.5	575			clearing
1639	45	3.2	7.3	585			"
1645	50	3.2	7.5	582			clean
1653	55	3.3	7.6	543			"
1707	60	3.5	7.4	551			"
1709	65	3.1	7.1	556			Imoff 1.25ml
1715	70	2.9	6.8	574			clean
1721	75	2.8	6.8	569			"
1726	80	3.0	7.1	573			"
1732	85	3.0	7.2	573			"
1737	90	2.8	7.2	566			"
1740	95	2.7	7.0	570		↓	"
1743	100	2.7	7.0	570		11.08	Imoff 1.0ml

Final Measurements: 2.7 7.0 570 11.08Total Volume Developed (gal.): 100  
Final Well Depth (ft. btoc): 47.08  
Photograph Number: \_\_\_\_\_

## MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATIONProject: galena afs  
Client:Well ID: 09 mw 010  
Date: 27 Aug 92  
Time: 1150Location: 09  
Weather: Cold and cloudy  
Supervisor: B. Coel

Comments:

Field MeasurementsHNU/OVA Reading (ppm):  
Water Depth (ft. btoc): 9.97  
Product Thickness (ft.):  
Well Volume (gal.):Product Depth (ft. btoc):  
Well Depth (ft. btoc): 47.10  
Saturated Thickness (ft.): 37.13  
5 well volumes (gal.):Development Method: Water Inertial Pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1130	-	-	-	-		9.97	0.0 ppm
1158	5	5.8	6.6	475			turbid
1203	10	3.6	6.5	411			"
1207	15	3.2	6.5	398			"
1213	20	3.0	6.4	390			"
1218	25	2.9	6.3	383			"
1225	30	3.2	6.2	387			"
1229	35	3.2	6.2	376			"
1235	40	3.0	6.3	369			"Imoff 1.5ml/liter
1247	45	3.2	6.2	350			Less turbid
1250	50	3.0	6.1	355			" "
1253	55	2.9	6.0	364			" "
1301	60	3.4	6.5	348			" "
1305	65	3.1	6.4	362			" "
1311	70	3.0	6.5	362			" "
1316	75	2.9	6.6	359			Clearing Imoff 1.5ml
1324	80	3.0	6.8	335			"
1329	85	2.9	6.8	340			"
1333	90	3.0	6.8	356			Clean
1336	95	2.8	6.8	344			"
1341	100	3.1	7.0	345			"
1345	105	2.8	7.1	347			"
1348	110	2.8	7.1	348		9.97	"Imoff .35ml/liter
end purge							
Final Measurements:		2.8	7.1	348			

Total Volume Developed (gal.): 110  
Final Well Depth (ft. btoc): 47.10  
Photograph Number:

# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: galena afs  
Client: \_\_\_\_\_

Well ID: 10 mw 01  
Date: 22 Aug 92  
Time: 1415

Location: 10  
Weather: \_\_\_\_\_  
Supervisor: P. Copen

Comments:

## Field Measurements

HNU/OVA Reading (ppm): 245  
Water Depth (ft. btoc): 13.34  
Product Thickness (ft.): \_\_\_\_\_  
Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 40.80  
Saturated Thickness (ft.): 33.40  
5 well volumes (gal.): \_\_\_\_\_

Development Method: Watera Inertial pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1400	-	-	-	-		13.34	0.0 ppm
1427	5	6.3	7.1	695			turbid
1431	10	5.6	6.6	670			"
1436	15	5.6	6.4	681			"
1438	20	5.5	6.1	694			"
1445	25	6.1	6.6	697			"
1448	30	5.1	6.7	693			" Imhoff 2.5ml
1453	35	4.8	3.3	687			Lightly turbid
1457	40	5.0	3.2	688			" "
1504	45	7.2	6.8	777			" "
1508	50	5.4	6.6	690			" "
1520	55	7.2	6.6	742			" "
1524	60	6.0	6.6	720			" Imhoff 2.0ml
1532	65	5.7	6.7	714			" "
1537	70	5.1	6.8	701			" "
1542	75	5.8	6.8	719			" "
1548	80	5.4	6.9	704			very lgt. turbidity
1554	85	5.5	6.9	708			" "
1602	90	5.5	6.9	673		14.39	" Imhoff .5ml
1602	end purge						

Final Measurements: 5.5 6.9 673 14.39

Total Volume Developed (gal.): 90  
Final Well Depth (ft. btoc): 40.70  
Photograph Number: \_\_\_\_\_

# MONITORING WELL DEVELOPMENT LOG

**RADIAN**  
CORPORATION

Project: GALENA AES  
Client: \_\_\_\_\_

Well ID: 10-MW-02  
Date: 18-AUG-96  
Time: 1520

Location: 10  
Weather: \_\_\_\_\_  
Supervisor: F. P. J. / A. /

Comments: \_\_\_\_\_

## Field Measurements

HNU/OVA Reading (ppm): 0.6 ppm  
Water Depth (ft. btoc): 13.31  
Product Thickness (ft.): \_\_\_\_\_  
Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 47.65  
Saturated Thickness (ft.): 34.34  
5 well volumes (gal.): \_\_\_\_\_

Development Method: Water Inertial Pump

Time	Cum. Vol. (gal.)	Water Quality				Water Level	Comments
		Temp.	pH	Cond	Turb		
1520	0	—	—	—		13.31	Very Turbid
1544	5	5.3	6.8	762			" "
1547	10	5.1	6.9	786			" "
1550	15	5.1	6.8	780			" "
1551	20	5.1	6.4	816			" "
1600	25	5.2	6.4	793			" "
1602	30	4.7	5.8	874			Imhoff = 18 ml / liter
1609	35	4.9	4.4	816			Very Turbid
1609	40	4.7	3.7	817			" "
1611	45	4.6	3.8	816			" "
1615	50	4.8	4.1	923			" "
1621	55	4.5	4.1	816			" "
1628	60	4.6	6.4	798			" "
1630	65	4.5	6.6	777			" "
1631	70	4.3	6.6	774			Imhoff = 13 ml / liter
1633	75	4.4	6.3	802			Very Turbid
1637	80	4.3	4.5	800			Turbid
1641	85	4.3	4.8	807			" "
1644	90	4.3	3.8	795			" "
1648	95	4.7	4.9	802			" "
1650	100	5.4	4.7	819			LT to Mod Turbid
1652	105	5.4	4.6	828			" "
1654	110	5.9	5.5	831		13.32	Imhoff - Cond. / Liter

Final Measurements: 

110	5.9	5.5	831	13.32
-----	-----	-----	-----	-------

Total Volume Developed (gal.): 110 gal.  
Final Well Depth (ft. btoc): 43-47.67  
Photograph Number: \_\_\_\_\_

\* Water level  
apparent - breaking  
shells.



**RADIAN**  
CREATION

Location: 12  
Weather: Cool and Rainy  
Supervisor: B. Coe

## Field Measurements

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 29.79  
Saturated Thickness (ft.): 16.65  
5 well volumes (gal.): \_\_\_\_\_

[illegible]

Total Volume Developed (gal.): 45  
Final Well Depth (ft. btoc): 28.94  
Photograph Number: \_\_\_\_\_

**RADIAN**  
CORPORATION

Well ID: 12 MW 02  
Date: 30 Aug 92  
Time: 1100

Location: 12  
Weather: Cool And Rainy.  
Supervisor: B. Coel

HNU/OVA Reading (ppm): \_\_\_\_\_  
 Water Depth (ft. btoc): 11.11  
 Product Thickness (ft.): \_\_\_\_\_  
 Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 210.52  
Saturated Thickness (ft.): 15.41  
5 well volumes (gal.): \_\_\_\_\_

[illegible]

Final Measurements: 

4.3	4.8	540		11.14
-----	-----	-----	--	-------

Total Volume Developed (gal.): 39  
Final Well Depth (ft. btoc): 240.12  
Photograph Number: \_\_\_\_\_

**1993 Well Development Forms**

VERMONT  
GROUNDWATER SAMPLING LOG

Project: Galena AFS RI  
Client: AFCEE

Well ID: 01 MW07  
Date: 9-9-93  
Time: 1310

Location: FTA  
Weather: CLOUD RAINY  
Samplers: CAT, DRT

Comments:

Field Measurements

HNU/OVA Reading (ppm): 0.0  
Water Depth (ft. btoc): 22.94  
Product Thickness (ft.):  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 50.13  
Saturated Thickness (ft.):  
3 well volumes (gal.):

Purge Method:

WATER PUMP

Sample Method:

Time	Cum. Vol. (gal.)	Water Quality				Comments
		Temp.	pH	Cond	Turbidity	
1329	—	—	—	—	—	
1335	5	1°C	6.63	1100	DK BROWN SILT	
1344	10.0	1°C	6.72	1070	"	
1351	15.0	1°C	6.72	1050	"	
1357	20.0	1°C	6.69	1060	"	
1409	25.0	1°C	6.71	1050	"	
1414	30.0	1°C	6.70	1040	"	
1421	35.0	1°C	6.72	1050	"	
1429	40.0	1°C	6.72	1040	"	
1435	45.0	1°C	6.73	1060	"	
1440	50.0	1°C	6.73	1060	"	WENT TO GET PALLET
1506	55.0	1°C	6.71	1090	"	
1510	60.0	1°C	6.72	1070	"	
1518	65.0	1°C	6.74	1090	"	
1523	70.0	1°C	6.68	1080	"	
1532	75.0	1°C	6.72	1090	"	
1536	80.0	1°C	6.72	1090	"	
1544	85.0	1°C	6.71	1090	"	
1550	90.0	1°C	6.71	1080		
1558	95.0	1°C	6.70	1100		
1611	100.0	1°C	6.71	1080		WENT TO GET DRUMS & PALLET
1655	105.0	1°C	6.67	1080		
1701	110	1°C	6.70	1080		
						Final Measurements

12822C.  
GROUNDWATER SAMPLING LOG

Project: Galena AFS RI  
Client: AFCEE

CONTINUATION

Well ID: 01mw07  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

Location: \_\_\_\_\_  
Weather: \_\_\_\_\_  
Samplers: \_\_\_\_\_

Comments:

Field Measurements

HNU/OVA Reading (ppm): \_\_\_\_\_  
Water Depth (ft. btoc): \_\_\_\_\_  
Product Thickness (ft.): \_\_\_\_\_  
Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): \_\_\_\_\_  
Saturated Thickness (ft.): \_\_\_\_\_  
3 well volumes (gal.): \_\_\_\_\_

Purge Method: \_\_\_\_\_

Sample Method: \_\_\_\_\_

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
1710	115.0	1°C	6.68	1100		DK brown silt/sand
1717	120.0	1°C	6.65	1050		
1725	125.0	1°C	6.70	1120		
1730	130.0	1°C	6.67	1080		
1739	135.0	1°C	6.72	1110		
1745	140.0	1°C	6.68	1100		LT. brown silt/sand
1754	145.0	1°C	6.71	1100		
1758	150.0	1°C	6.68	1100		
1807	155.0	1°C	6.71	1100		- Heavy Sand
1813	160.0	1°C	6.67	1100		
1821	165.0	1°C	6.70	1100		
1827	170.0	1°C	6.66	1100		
1839	175.0	1°C	6.72	1100		New Drum
1845	180.0	1°C	6.69	1100		Imhoff Cone -
1853	185.0	1°C	6.71	1100		
1858	190.0	1°C	6.67	1100		
1907	195.0	1°C	6.70	1100		
1911	200.0	1°C	6.66	1100		Stopped - E.O.D.
1104	205.0	1°C	6.64	1070		
1111	210.0	1°C	6.65	1070		
1117	220.0	1°C	6.64	1070		
1126	225.0	1°C	6.68	1080		
1131	230.0	1°C	6.67	1070		
						Final Measurements

**Project:** Galena AFS RI  
**Client:** AFCEE

CONTINUATION - p. 3

Well ID: 01 MW07  
Date: 9-10-93  
Time: \_\_\_\_\_

Location: \_\_\_\_\_  
Weather: \_\_\_\_\_  
Samplers: \_\_\_\_\_

Comments: QUIT PER TOMB COUNCIL

### Field Measurements

HNU/OVA Reading (ppm): \_\_\_\_\_  
 Water Depth (ft. btoc): \_\_\_\_\_  
 Product Thickness (ft.): \_\_\_\_\_  
 Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): \_\_\_\_\_  
Saturated Thickness (ft.): \_\_\_\_\_  
3 well volumes (gal.): \_\_\_\_\_

**Purge Method:**

**Sample Method:**

[illegible]

VERLUMCAT  
GROUNDWATER SAMPLING LOG

Project: Galena AFS RI  
Client: AFCEE

Well ID: 01MH08  
Date: 9-10-93  
Time: 1324

Location: FTA  
Weather: SO'S PARTLY CLOUDY  
Samplers: GAT/ART

Comments:

Field Measurements

HNU/OVA Reading (ppm): 0.0  
Water Depth (ft. btoc): 28.35  
Product Thickness (ft.): 22  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 45.23  
Saturated Thickness (ft.):  
3 well volumes (gal.):

Purge Method:

WATER PUMP

Sample Method:

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
1340	—	—	—	—	—	Start
1345	5.0	1.0°C	6.73	1290		DARK BROWN SILT/SAND
1352	10.0	1°C	6.85	1280		
1400	15.0	1°C	6.87	1290		
1407	20.0	1°C	6.85	1280		
1414	25.0	1°C	6.87	1280		
1419	30.0	1°C	6.87	1280		
1425	35.0	1°C	6.88	1290		
1432	40.0	1°C	6.90	1280		
1440	45.0	1°C	6.85	1280		
1446	50.0	1°C	6.87	1280		
1454	55.0	1°C	6.90	1280		
1459	60.0	1°C	6.86	1280		
1506	65.0	1°C	6.85	1280		
1511	70.0	1°C	6.87	1280		
→ 1521	75.0	1°C	6.89	1280		New Drum
1526	80.0	1°C	6.87	1280		
1534	85.0	1°C	6.86	1280		
1539	90.0	1°C	6.88	1280		
1547	95.0	1°C	6.93	1280		Very Sandy!
1551	100.0	1°C	6.88	1270		
1558	105.0	1°C	6.89	1280		Indiff Cone
1606	110.0	1°C	6.91	1270		
						Final Measurements





Development  
GROUNDWATER SAMPLING LOG

Project: Galena AFS RI  
Client: AFCEE

Well ID: 05-MW-13  
Date: 9-6-93 / 9-7-93  
Time: 1815

Location: SE OF GALENA AFB ENTRANCE - NEXT TO FENCE  
Weather: RAINY  
Samplers: GAT/DRT

Comments:

FINAL IMHOFF COUE < 0.5 ml

Field Measurements

HNU/OVA Reading (ppm): 0.0 / 0.0  
Water Depth (ft. btoc): 18.69 ft / 18.81 ft  
Product Thickness (ft.):  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 37.76 ft.  
Saturated Thickness (ft.):  
3 well volumes (gal.):

Purge Method: WATERREA

Sample Method:

Time	Cum. Vol. (gal.)	Water Quality				Comments
		Temp.	pH	Cond	Turbidity	
1832	—	—	—	—	—	
1839	5.0	1.0°C	6.49	1160	DK. BROWN	
1845	10.0	1.0°C	6.51	1130	"	
1853	15.0	1.0°C	6.58	1150	"	
1900	20.0	1.0°C	6.50	1140	"	
1908	25.0	1.0°C	6.57	1150	"	
1914	30.0	1.0°C	6.59	1140	"	
1922	35.0	1.0°C	6.57	1140	"	
1927	—	—	—	—	—	END OF DEVEL. FOR E.O.D.
0830	40.0	1.0°C	6.48	1130	DK BROWN	
0842	45.0	1.0°C	6.52	1120	"	
0848	50.0	1.0°C	6.50	1120	"	DRUM FILLED/GO GET NEW DRUM
0908	55.0	1.0°C	6.51	1120	"	WATER CLEARING
0916	60.0	1.0°C	6.53	1120	"	
0923	65.0	1.0°C	6.56	1120	Semi-Clean	
0932	70.0	1.0°C	6.51	1130	"	
0943	75.0	1.0°C	6.56	1130	"	
0949	80.0	1.0°C	6.52	1130	"	
0959	85.0	1.0°C	6.54	1110		
1006	90.0	1.0°C	6.54	1120		
1015	95.0	1.0°C	6.55	1120		
1344	—	—	—	—	—	18.69' - Water Depth
Final Measurements						

VELOCITY MONITOR  
GROUNDWATER SAMPLING LOG

Project: Galena AFS RI  
Client: AFCEE

Well ID: 05 MW 14  
Date: 9-9-93  
Time: 0830

Location: RUNWAY  
Weather: COLD, RAINY  
Samplers: GAT 100T

Comments: NO PVC CAP ON WELL

IMHOFF CONE = 0.25 m

Field Measurements

HNU/OVA Reading (ppm):

Water Depth (ft. btoc): 13.18

Product Thickness (ft.):

Well Volume (gal.):

Product Depth (ft. btoc):

Well Depth (ft. btoc): 35.28

Saturated Thickness (ft.):

3 well volumes (gal.):

Purge Method:

Sample Method:

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
0853	—	—	—	—	—	Start
0858	5.0	1°C	—	900	DK. BROWN SILT./SAND	
0907	10.0	1°C	6.60	880	"	" / "
0916	15.0	1°C	6.60	900	"	" / "
0920	20.0	1°C	6.56	890	"	" / "
0927	25.0	1°C	6.57	890	"	" / "
0933	30.0	1°C	6.57	890	"	" / "
0941	35.0	1°C	6.58	890	"	" / "
0945	40.0	1°C	6.58	900	"	" / "
0951	45.0	1°C	6.61	890	LT. BROWN SILT./SAND	
0956	50.0	1°C	6.57	900	"	" / "
1003	55.0	1°C	6.62	890	"	" / " NEW DATA
1008	60.0	1°C	6.59	880	"	" / "
1016	65.0	1°C	6.63	890	"	" / "
1020	70.0	1°C	6.59	890	"	" / "
1027	75.0	1°C	6.64	900	"	" / "
1033	80.0	1°C	6.61	890	Almost Clear - Sand	
1040	85.0	1°C	6.65	900	"	"
1045	90.0	1°C	6.61	890	"	"
1052	95.0	1°C	6.69	900	"	"
1100	100	1°C	6.68	890		IMHOFF CONE
1111						W/L 13.15
						Final Measurements

Development  
**GROUNDWATER SAMPLING LOG**

Project: Galena AFS RI  
Client: AFCEE

Well ID: ~~05MW15~~ 05MW15  
Date: 9-8-92  
Time: 1352

Location: Runway  
Weather: COLD CLOUDY  
Samplers: CAT, DRT

Comments:

IMHOFF CONE < 5 ml

**Field Measurements**

HNU/OVA Reading (ppm): 0.0  
Water Depth (ft. btoc): 14.82  
Product Thickness (ft.):  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 35.32  
Saturated Thickness (ft.):  
3 well volumes (gal.):

Purge Method: WATER PUMP

Sample Method:

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
1412	—	—	—	—	—	Start.
1421	5.0	1°C	6.81	960	DK. BROWN Silt	
1429	10.0	1°C	6.76	930	"	
1436	15.0	1°C	6.76	940	"	
1441	20.0	1°C	6.76	930	"	
1448	25.0	1°C	6.81	930	"	
1454	30.0	1°C	6.74	910	"	
1503	35.0	1°C	6.78	920	"	
1509	40.0	1°C	6.79	900	"	
1519	45.0	1°C	6.82	910	LT. BROWN Silt	
1524	50.0	1°C	6.75	900		WENT TO GET DRUM
1601	55.0	1°C	6.75	900		
1610	60.0	1°C	6.76	910		
1615	65.0	1°C	6.75	900		CLEARING SOMEWHAT
1625	70.0	1°C	6.80	900		
1630	75.0	1°C	6.72	900		
1640	80.0	1°C	6.78	890		
1646	85.0	1°C	6.76	890		
1655	90.0	1°C	6.79	890		
1700	95.0	1°C	6.74	890		
1710	100.0	1°C	6.78	880		New Drum
1734	105.0	1°C	6.70	870		
1741	110.0	1°C	6.76	880		
						Final Measurements

05-MW-15 (cont'd)

<u>Time</u>	<u>Vol</u>	<u>Temp</u>	<u>pH</u>	<u>Cond.</u>	<u>Turb.</u>	<u>Comments</u>
1749	115.0	1°C	6.77	880	Almost Clear	Some Sand
- 1757	120.0	1°C	6.78	870	"	Imhoff Cone
1803	125.0	1°C	6.73	880	"	"
1809	130.0	1°C	6.74	880	"	
- 1818	135.0	1°C	6.79	880	"	Imhoff Cone
1841	-	-	-	-	W/L 14.73	

# DEVELOPMENT GROUNDWATER SAMPLING LOG

Project: Galena AFS RI  
Client: AFCEE

Well ID: 06-MW-07  
Date: 9-6-93  
Time:

Location: PM (S. SIDE NEXT TO FENCE)  
Weather: RAINY  
Samplers: GAT/DRT

Comments:

FINAL IMHOFF CONE < 0.5" ML

## Field Measurements

HNU/OVA Reading (ppm):  
Water Depth (ft. btoc): 23.51 ft.  
Product Thickness (ft.):  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 43.74 ft.  
Saturated Thickness (ft.):  
3 well volumes (gal.):

Purge Method:

Sample Method:

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
1600	—	—	—	—	—	
1625	5.0	4°C	6.68	1370	DK BRN	
1652	10.0	3°C	6.66	1360	MED BRN	
1705	11.0	—	—	—	—	PUMPED DRY - ADDED TO NEXT WELL
1751	—	—	—	—	—	W/C 23.60
1413	16.0	2°C	6.53	1460	LT BRN	
1420	21.0	2°C	6.49	1440	"	
1426	26.0	2°C	6.58	1460	"	
1435	31.0	2°C	6.62	1460	"	
1440	36.0	2°C	6.52	1460	"	
1449	41.0	2°C	6.60	1450	"	
1455	46.0	2°C	6.52	1450		
1505	51.0	2°C	6.57	1460		
1510	56.0	2°C	6.61	1460		
1519	61.0	2°C	6.58	1460		
1527	66.0	2°C	6.59	1470		
1535	71.0	2°C	6.60	1460		
1611	76.0	2°C	6.56	1450		
1621	81.0	2°C	6.60	1460		CLEARING - Very sandy
1630	86.0	2°C	6.71	1440		"
1637	91.0	2°C	6.61	1460		"
1648	96.0	2°C	6.45	1450		"
1656	81.0	2°C	6.61	1450		"
	101.6					Final Measurements

over

12.9

06-MW-07 (cont'd.)

<u>Time</u>	<u>Vol</u>	<u>Temp</u>	<u>pH</u>	<u>Concl.</u>	<u>Turb.</u>	<u>Comments</u>
1707	<del>86.0</del> 106.0	20C	6.62	1460	Almost Clear	- some sand Imhoff Cone
1727	—	—				- Water Level 23.60'

DEV.  
GROUNDWATER SAMPLING LOG

Project: Galena AFS RI  
Client: AFCEE

Well ID: 09MW05 MR  
Date: 9-10-93  
Time: 1747

Location: END OF RUNWAY  
Weather: CLOUDY WARM  
Samplers: GAT/DRI

Comments:

Field Measurements

HNU/OVA Reading (ppm): 0.0  
Water Depth (ft. btoc): 12.74  
Product Thickness (ft.):  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc):  
Saturated Thickness (ft.):  
3 well volumes (gal.):

Purge Method: WATER PUMP

Sample Method:

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
1805	—	—	—	—	—	Start
1809	5.0	20°C	6.78	1010	Semi-Clear	Sand
1815	10.0	20°C	6.85	1040		
1828	15.0	30°C	6.89	1030		
1833	20.0	20°C	6.88	1030		
1840	25.0	20°C	6.85	1030		
1846	30.0	20°C	6.84	1020		
1852	35.0	20°C	6.84	1030		
1858	40.0	20°C	6.87	1030		
1904	45.0	20°C	6.84	1030		
1910	50.0	20°C	6.84	1030		Stop - E.O.D.
0831	55.0	10°C	6.57	1020	Very Clear	—
0836	60.0	10°C	6.74	1010	"	—
0842	65.0	10°C	6.80	1010	"	—
0847	70.0	10°C	6.81	1010	"	New Drum
0855	75.0	10°C	6.82	1010	"	—
0900	80.0	10°C	6.83	1010	"	—
0905	85.0	10°C	6.77	1010	"	—
0909	90.0	10°C	6.81	1010	"	—
0914	95.0	10°C	6.80	1010	"	—
0922	100.0	10°C	6.84	1010	"	—
0928	—	—	—	—	—	12.51' water Depth
Final Measurements						

E-168

4<sup>th</sup> attempt (lost surge block first time) will have 9<sup>th</sup>.  
Redevelopment successful





# DEVELOPMENT GROUNDWATER SAMPLING LOG

Project: Galena AFS RI  
Client: AFCEE

Well ID: 10MW04  
Date: 9-6-93  
Time: 1155

Location: EAST ALERT HANGAR (S.E. CORNER)  
Weather: RAINING 11°C  
Samplers: GAT, DRT

Comments:

FINAL IMHOFF CONE < 0.5 ml

## Field Measurements

HNU/OVA Reading (ppm): 2.4  
Water Depth (ft. btoc): 15.16 ft / 14.92  
Product Thickness (ft.):  
Well Volume (gal.):

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 35.14 ft.  
Saturated Thickness (ft.):  
3 well volumes (gal.):

Purge Method: WATER - 1" ID

Sample Method:

Time	Cum. Vol. (gal.)	Water Quality				Comments
		Temp.	pH	Cond	Turbidity	
1215	—	—	—	—	—	
1234	5.0	2°C	6.79	1050	DK BROWN	
1242	10.0	1°C	6.83	1060	" "	
1250	15.0	1°C	6.83	1070	" "	
1255	20.0	1°C	6.86	1070	LT. BROWN	
1305	25.0	1°C	6.85	1050	" "	
1310	30.0	1°C	6.87	1070	" "	
1316	35.0	1°C	6.89	1050	" "	
1324	40.0	1°C	6.87	1070	" "	
1333	45.0	1°C	6.88	1090	Semi-Clean	- Imhoff Cone (1.2 at 4 hrs)
1342	50.0	1°C	6.86	1090	" "	
1351	55.0	1°C	6.91	1090	" "	
1356	60.0	1°C	6.91	1080	" "	
1407	65.0	1°C	6.92	1090	Almost Clean	- Imhoff Cone (0.8 at 4 hrs)
1424	70.0	1°C	6.89	1080	"	
0915	—	—	—	—	—	
0925	75.0	1°C	6.73	1080	LT. BROWN	
0935	80.0	1°C	6.78	1090	Semi-Clean	
0943	85.0	1°C	6.80	1090	"	
0951	90.0	1°C	6.82	1100	"	
0959	95.0	1°C	6.86	1110	"	
1005	100.0	1°C	6.83	1100	"	Imhoff Cone
1042	105.0	1°C	6.71	1110	"	
Final Measurements						

OVER

10-UW-04 (cont'd.)

<u>Time</u>	<u>Vol.</u>	<u>Temp.</u>	<u>pH</u>	<u>Cond.</u>	<u>Turb.</u>	<u>Comments</u>
1051	110.0	1°C	6.79	1100	Semi. clear	
1059	115.0	1°C	6.79	1090	Almost clear	
1107	120.0	1°C	6.77	1100	"	
1116	125.0	1°C	6.82	1100	"	
1124	130.0	1°C	6.85	1100	"	Anchovy Cone
1135	135	1°C	6.80	1100		
1143	140	1°C	6.80	1110		

1328 w/L = 14.88

**1992 Groundwater Sampling Forms**

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 9-2-92 LOG TIME 1439  
 LOCATION ID 01-mw-01  
 SAMPLE TYPE N SAMPLE ID 01-mw-01-01

INITIAL GROUNDWATER DEPTH (FT) 110.75 to 49.94  
 SAMPLING PERIOD: START 1550 COMPLETE 1610  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-3-92

COMMENTS Over - 0ppm BH ; 0ppm 132  
recalibrate pH meter buffer 7 set to 7.0, buffer 4 set to 4.0

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.2</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>577</u>	
REDOX POTENTIAL	EH	mvolts	<u>-22</u>	
TEMPERATURE	TEMP	°C	<u>1.4</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>692</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1439	0.0	--	--	--	START PUMPING
1459	15.0	4.4	611	2.3	recalibrate meter
1505	20.0	5.5	593	1.9	
1514	25.0	5.5	586	1.4	
1519	30.0	5.7	586	1.4	
1525	35.0	5.7	586	1.3	
1530	40.0	6.1	588	1.4	recheck calibration
1537	45.0	6.4	552	1.5	
1540	48.0	6.5	558	1.3	
1544	50.0	6.2	577	1.4	

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 9-9-92 LOG TIME 11010  
 LOCATION ID 01mw02  
 SAMPLE TYPE N SAMPLE ID 01-mw-02-01

INITIAL GROUNDWATER DEPTH (FT) 15.87 td: 29.8  
 SAMPLING PERIOD: START 11010 COMPLETE 11030  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-10-92

COMMENTS Sunny, 35°. Oum = 0.0 ppm. BH  
Dup for 01-05-07; ms/msd collected 9-10-92 @ 1200

FINAL PARAMETER MEASUREMENTS:				COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>10.10</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>865</u>	
REDOX POTENTIAL	Eh	mvolts	<u>107</u>	
TEMPERATURE	TEMP	°C	<u>1.10</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>780</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1530	0.0	--	--	--	START PUMPING
1536	5	7.0	850	1.1	
1544	10	10.7	840	0.7	
1550	20	10.7	840	0.9	
11010	25	10.10	865	1.10	

SAMPLES TYPES: (WSACODE)

SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 9-9-92 LOG TIME 11010  
 LOCATION ID 01-mw-02  
 SAMPLE TYPE D SAMPLE ID 01-DS-07

INITIAL GROUNDWATER DEPTH (FT) 15.87 td=29.8  
 SAMPLING PERIOD: START 11010 COMPLETE 11030  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-10-92

COMMENTS

Dup for 01-mw-02-01

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>10.10</u>	_____
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>865</u>	_____
REDOX POTENTIAL	Eh	mvolts	<u>107</u>	_____
TEMPERATURE	TEMP	$^{\circ}$ C	<u>1.10</u>	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>772</u>	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1530	0.0	--	--	--	START PUMPING
11010	25	10.10	865	1.10	See form for 01-mw-02-01

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID QA122 LOG DATE 9-9-92 LOG TIME 11025  
 LOCATION ID 01-mw-03  
 SAMPLE TYPE N SAMPLE ID 01-mw-03-01

INITIAL GROUNDWATER DEPTH (FT) 110.44 td=28.30  
 SAMPLING PERIOD: START 11025 COMPLETE 11045  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-10-92

COMMENTS Sunny, 35°. Dup for DS-06

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>10.7</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>916</u>	
REDOX POTENTIAL	Eh	mvolts	<u>91</u>	
TEMPERATURE	TEMP	°C	<u>1.2</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>832</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1530	0.0	--	--	--	START PUMPING
1539	3	6.8	860	0.8	
1545	10	6.8	859	0.5	
1555	10				Purged dry
1605	15	6.7	899	0.9	
1625	20	6.7	916	1.2	Start Sampling

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID QALena LOG DATE 9-9-92 LOG TIME 11025  
 LOCATION ID 01-mw-03  
 SAMPLE TYPE D SAMPLE ID 01-D5-010

INITIAL GROUNDWATER DEPTH (FT) 11044 Ed-28.30  
 SAMPLING PERIOD: START 11025 COMPLETE 11045  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-10-92

COMMENTS Duplicate of 01-mw-03

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.7</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>916</u>	
REDOX POTENTIAL	Eh	mvolts	<u>91</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>1.2</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>840</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1530	0.0	--	--	--	START PUMPING
11025	20	6.7	916	1.2	See form for 01-mw-03-01

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	



# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID QALERO LOG DATE 9-9-92 LOG TIME 1220  
 LOCATION ID 01-mw-04  
 SAMPLE TYPE N SAMPLE ID 01-mw-04-01

INITIAL GROUNDWATER DEPTH (FT) 14.11 to 22.62 purge vol. 10 gal  
 SAMPLING PERIOD: START 1220 COMPLETE 1240  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-10-92

COMMENTS Clearing, Cold. Ovm. Oppm BH.

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>4.9*</u> <u>meter out of cal.</u>
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>595</u>
REDOX POTENTIAL	Eh	mvolts	<u>133</u>
TEMPERATURE	TEMP	$^{\circ}$ C	<u>2.7</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>648</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1135	0.0	-	-	-	START PUMPING
1138	2	5.8*	505	2.8	
1151	8	4.9	638	2.9	
1207	10	4.9	626	2.9	
1218	24	4.9	595	2.7	end purge

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID QARNA LOG DATE 9-9-92 LOG TIME 1100  
 LOCATION ID Q1-mw-05  
 SAMPLE TYPE N SAMPLE ID Q1-mw-05-a

INITIAL GROUNDWATER DEPTH (FT) 110.09 to 25.89  
 SAMPLING PERIOD: START 1100 COMPLETE 1120  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-10-92

COMMENTS Q1m - 0 ppm BH; partly cloudy.  
cool; flurries.

FINAL PARAMETER MEASUREMENTS:				COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.0</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>440</u>	
REDOX POTENTIAL	Eh	mvolts	<u>45</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>1.8</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>600</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1020	0.0	--	--	--	START PUMPING
1030	7	7.11		2.0	meter #91 battery low - switched to #90
1040	15	6.5	290	1.5	
1050	20	6.8	450	1.9	and falling - meter bat. low.
1100	25	7.0	440	1.8	

SAMPLES TYPES: (WSACODE)

D -	DUPLICATE	FB -	FIELD BLANK
R -	REPLICATE	TB -	TRIP BLANK
S -	SPIKE	LB -	LAB BLANK
K -	KNOWN	N -	NORMAL

SAMPLE METHODS: (WSMCODE)

G -	GRAB	SP -	SUBMERSIBLE PUMP
B -	BAILER	AL -	AIR-LIFT SAMPLER
PP -	PERISTALIC PUMP	BP -	BLADDER PUMP
SL -	SUCTION LIFT PUMP		

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 9-2-92 LOG TIME 1530  
 LOCATION ID 01mw000  
 SAMPLE TYPE N SAMPLE ID 01-mw-00-01

INITIAL GROUNDWATER DEPTH (FT) 15.40 to 27.00  
 SAMPLING PERIOD: START 1640 COMPLETE 1700  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-3-92

COMMENTS 01m: BZ-3ppm, BH 29ppm

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.8</u>
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/cm	<u>650</u>
REDOX POTENTIAL	Eh	mvolts	<u>160</u>
TEMPERATURE	TEMP	$^{\circ}$ C	<u>1.5</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>780</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1530	0.0	--	--	--	START PUMPING
1535	2.5	6.6	640	1.6	
1549	5	6.6	636	1.3	
1622	10	6.7	645	1.5	
1629	13	5.7	667	1.2	RECHECK PH meter
1639	14	6.8	650	1.5	O.K. now.

## SAMPLES TYPES: (WSACODE)

D -	DUPLICATE	FB -	FIELD BLANK
R -	REPLICATE	TB -	TRIP BLANK
S -	SPIKE	LB -	LAB BLANK
K -	KNOWN	N -	NORMAL

## SAMPLE METHODS: (WSMCODE)

G -	GRAB	SP -	SUBMERSIBLE PUMP
B -	BAILER	AL -	AIR-LIFT SAMPLER
PP -	PERISTALTIC PUMP	BP -	BLADDER PUMP
SL -	SUCTION LIFT PUMP		

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 001002 LOG DATE 9-20-92 LOG TIME 0710  
 LOCATION ID 02-GW-01  
 SAMPLE TYPE N SAMPLE ID 02-GW-01-01

INITIAL GROUNDWATER DEPTH (FT) purged well line 20 min at flow rate ~10 gal/min  
 SAMPLING PERIOD: START 0710 COMPLETE \_\_\_\_\_  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-21-92

COMMENTS Base water supply well #1

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.7</u>	_____
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/cm	<u>237</u>	_____
REDOX POTENTIAL	Eh	mvolts	<u>-39</u>	_____
TEMPERATURE	TEMP	$^{\circ}$ C	<u>4.6</u>	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>446</u>	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
	0.0	--	--	--	START PUMPING

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE    FB - FIELD BLANK  
 R - REPLICATE    TB - TRIP BLANK  
 S - SPIKE        LB - LAB BLANK  
 K - KNOWN        N - NORMAL

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Q01072 LOG DATE 9-20-92 LOG TIME 0820  
 LOCATION ID 02-GW-02  
 SAMPLE TYPE N SAMPLE ID 02-GW-02-01

INITIAL GROUNDWATER DEPTH (FT) --  
 SAMPLING PERIOD: START 0820 COMPLETE  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-21-92

COMMENTS

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.1</u>
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>240</u>
REDOX POTENTIAL	Eh	mvolts	<u>-84</u>
TEMPERATURE	TEMP	$^{\circ}$ C	<u>5.3</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>240</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
	0.0	--	--	--	START PUMPING

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE	FB - FIELD BLANK
R - REPLICATE	TB - TRIP BLANK
S - SPIKE	LB - LAB BLANK
K - KNOWN	N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB	SP - SUBMERSIBLE PUMP
B - BAILER	AL - AIR-LIFT SAMPLER
PP - PERISTALTIC PUMP	BP - BLADDER PUMP
SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 00192 LOG DATE 10-5-92 LOG TIME 1500  
 LOCATION ID 02-GW-03  
 SAMPLE TYPE N SAMPLE ID 02-GW-03-01

INITIAL GROUNDWATER DEPTH (FT) -  
 SAMPLING PERIOD: START 1500 COMPLETE 1510  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-6-92

COMMENTS

New base water supply well in water plant

FINAL PARAMETER MEASUREMENTS:

POTENTIAL OF HYDROGEN  
 SPECIFIC CONDUCTANCE  
 REDOX POTENTIAL  
 TEMPERATURE  
 ALKALINITY (CaCO<sub>3</sub>)

pH S.U. 6.8  
 SC  $\mu$ mhos/c 304  
 Eh mvolts 085?  
 TEMP °C -  
 ALK mg/l 240

COMMENTS

took bottle back  
to office to  
make measurements.

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP (°C)	COMMENTS
<u>1500</u>	<u>0.0</u>	<u>--</u>	<u>--</u>	<u>--</u>	<u>START PUMPING</u>
					<u>no purging</u>
					<u>let small amount</u>
					<u>of water to clean lines--</u>
					<u>and well in constant</u>
					<u>use.)</u>

SAMPLES TYPES: (WSACODE)

D - DUPLICATE FB - FIELD BLANK  
 R - REPLICATE TB - TRIP BLANK  
 S - SPIKE LB - LAB BLANK  
 K - KNOWN N - NORMAL

SAMPLE METHODS: (WSMCODE)

G - GRAB SP - SUBMERSIBLE PUMP  
 B - BAILER AL - AIR-LIFT SAMPLER  
 PP - PERISTALTIC PUMP BP - BLADDER PUMP  
 SL - SUCTION LIFT PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 001000 LOG DATE 10-5-92 LOG TIME 1500  
 LOCATION ID 02 GW03  
 SAMPLE TYPE D SAMPLE ID 02-0501

INITIAL GROUNDWATER DEPTH (FT) —  
 SAMPLING PERIOD: START 1500 COMPLETE 1510  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-6-92

COMMENTS New base water supply used in  
water plant.

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.8</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>298</u>	
REDOX POTENTIAL	Eh	mvolts	<u>0107</u>	→ took bottle back
TEMPERATURE	TEMP	°C	<u>-</u>	to office for
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>242</u>	measurements

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP (°C)	COMMENTS
1500	0.0	--	--	--	START PUMPING
					no purging.
					(let small amount
					of water run to
					clean lines - well
					in constant use.)

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 10-5-92 LOG TIME 1515  
 LOCATION ID 02-GW04  
 SAMPLE TYPE N SAMPLE ID 02-GW04-01

INITIAL GROUNDWATER DEPTH (FT) —  
 SAMPLING PERIOD: START 1515 COMPLETE —  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-6-92

COMMENTS Backup base water supply well - not used in several months 200 ft deep. probably not a good sample (not purged enough.)

FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.0</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/cm	<u>269</u>	
REDOX POTENTIAL	Eh	mvolts	<u>013</u> →	<u>probably not valid - measured in office.</u>
TEMPERATURE	TEMP	°C	→	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>240</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
	0.0	--	--	--	START PUMPING
1515		7.0	269	-	purged a couple gallons to clean lines would have to drain many more to purge the well as this well has not been used in months should be sampled in summer when many gallons are used daily to wet roads; petroleum odor in pump building.

SAMPLES TYPES: (WSACODE)

SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	



# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Old Town 03-01-01 LOG DATE 9-14-92 LOG TIME 1130  
 LOCATION ID 03-GW-01  
 SAMPLE TYPE N SAMPLE ID 03-GW-01-01

INITIAL GROUNDWATER DEPTH (FT) —  
 SAMPLING PERIOD: START 1105 COMPLETE 1700  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-15-92

COMMENTS Edwin & Dorothy Fears Domestic Well.  
Sampled from faucet at pressure tank.

## FINAL PARAMETER MEASUREMENTS:

				COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.3</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>253</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-132</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>2.7</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>310</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1105	0.0	—	—	—	START PUMPING
1130	—	7.3	253	2.7	sampled.

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Old Town Galena LOG DATE 9-14-92 LOG TIME 1730  
 LOCATION ID 03-GW-02-01  
 SAMPLE TYPE N SAMPLE ID 03-GW-02-01

INITIAL GROUNDWATER DEPTH (FT) -  
 SAMPLING PERIOD: START 1720 COMPLETE 1730  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-15-92

COMMENTS Daniel Patrick's Domestic Well.  
Sampled at faucet before filter unit.

FINAL PARAMETER MEASUREMENTS:				COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.0</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>331</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-110</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>3.5</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>498</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
	0.0	--	--	--	START PUMPING
1730	-	7.0	331	3.5	Sampled.

## SAMPLES TYPES: (WSACODE)

D -	DUPLICATE	FB -	FIELD BLANK
R -	REPLICATE	TB -	TRIP BLANK
S -	SPIKE	LB -	LAB BLANK
K -	KNOWN	N -	NORMAL

## SAMPLE METHODS: (WSMCODE)

G -	GRAB	SP -	SUBMERSIBLE PUMP
B -	BAILER	AL -	AIR-LIFT SAMPLER
PP -	PERISTALTIC PUMP	BP -	BLADDER PUMP
SL -	SUCTION LIFT PUMP		

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Old town Galena LOG DATE 10-5-92 LOG TIME 1100  
 LOCATION ID 03-GW-03  
 SAMPLE TYPE N SAMPLE ID 03-GW-03-01

INITIAL GROUNDWATER DEPTH (FT) -  
 SAMPLING PERIOD: START 1100 COMPLETE 1130  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-6-92

COMMENTS Norman Burgess and Roland Chadbourne  
Well - West end of old Galena, on the River.

## FINAL PARAMETER MEASUREMENTS:

POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.0</u>	COMMENTS
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>459</u>	<u>@8.7°C measurement temp.</u>
REDOX POTENTIAL	Eh	mvolts	<u>50</u>	<u>"</u>
TEMPERATURE	TEMP	°C	<u>-</u>	<u>probably changed</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>315</u>	<u>took sample to off site</u>
				<u>for measurements</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP (°C)	COMMENTS
1045	0.0	--	--	--	START PUMPING
					allowed well to run
					for 15 min to clear
					line from River.
					- 1L / 5 sec

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Old town 04100 LOG DATE 10-5-92 LOG TIME 1100  
 LOCATION ID 03-GW-03  
 SAMPLE TYPE D SAMPLE ID 03-05-01

INITIAL GROUNDWATER DEPTH (FT) -  
 SAMPLING PERIOD: START 1100 COMPLETE 1130  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-6-92

COMMENTS field duplicate of 03-GW-03-01 -  
N. Burgett's and R. Chodbourne's well.

FINAL PARAMETER MEASUREMENTS: COMMENTS  
 POTENTIAL OF HYDROGEN pH S.U. 6.8 @ 8.7°C meas. temp  
 SPECIFIC CONDUCTANCE SC  $\mu$ mhos/c 457 "  
 REDOX POTENTIAL Eh mvolts -36 - not a good number.  
 TEMPERATURE TEMP °C 31.6  
 ALKALINITY (CaCO<sub>3</sub>) ALK mg/l 316

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP (°C)	COMMENTS
1045	0.0	--	--	--	START PUMPING
					allowed water to
					run for 15 minutes
					to clear line from
					River.
					~1 L/Sec.

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN  
 FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP  
 SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Oldtown 03-0100 LOG DATE 10-5-92 LOG TIME 11015  
 LOCATION ID 03-GW-04  
 SAMPLE TYPE N SAMPLE ID 03-GW-04-01

INITIAL GROUNDWATER DEPTH (FT) -  
 SAMPLING PERIOD: START 11015 COMPLETE 11045  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-6-92

COMMENTS well @ Hobbs Vulcan Im.

## FINAL PARAMETER MEASUREMENTS:

POTENTIAL OF HYDROGEN

pH

S.U.

measured in office

measured at well head

COMMENTS

SPECIFIC CONDUCTANCE

SC

$\mu$ mhos/c

REDOX POTENTIAL

Eh

mvolts

TEMPERATURE

TEMP

$^{\circ}$ C

ALKALINITY (CaCO<sub>3</sub>)

ALK

mg/l

6.3  
513  
-007  
-  
414

5.9  
525  
100  
5.5  
-

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
11015	0.0	--	--	--	START PUMPING
					Well only 52' deep
					someone just finished
					a load of laundry - no
					need to purge (By-
					passed holding tank,
					but goes through filter
					Sears model #
					329.347300

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB -  
 TB -  
 LB -  
 N -

FIELD BLANK  
 TRIP BLANK  
 LAB BLANK  
 NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 04192 LOG DATE 9-2-92 LOG TIME 1115  
 LOCATION ID 04mw02  
 SAMPLE TYPE N SAMPLE ID 04mw02-01

INITIAL GROUNDWATER DEPTH (FT) 17.14 to 18.00  
 SAMPLING PERIOD: START 1900 COMPLETE 1930  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-3-92

COMMENTS not enough water to use watera.  
pumped as much water as possible, then came back later to sample  
with bailer. Flush mount well has been run over by heavy equipment.

FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>5.9</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>570</u>	
REDOX POTENTIAL	Eh	mvolts	<u>195</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>1.6</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>580</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1115	0.0	-	-	-	START PUMPING
1125	0.1	-	-	-	not enough water to fill watera tubing.

SAMPLES TYPES: (WSACODE)

SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 04100 LOG DATE 9-2-92 LOG TIME 1120  
 LOCATION ID 04mw03  
 SAMPLE TYPE N SAMPLE ID 04-mw03-01

INITIAL GROUNDWATER DEPTH (FT) 12.10 to 22.94  
 SAMPLING PERIOD: START 1200 COMPLETE 1220  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-3-92

COMMENTS 0.1m BH - 0.0ppm, BZ - 0.0ppm.

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.1</u>
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>632</u>
REDOX POTENTIAL	Eh	mvolts	<u>-88</u>
TEMPERATURE	TEMP	$^{\circ}$ C	<u>9.2</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>598</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1120	0.0	--	--	--	START PUMPING
1126	2	6.5	712	8.4	very muddy water
1136	6	6.6	681	8.7	"
1142	10	6.5	667	8.6	"
1150	14	6.3	637	9.0	"
1154	16	6.1	632	9.2	"

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 001000 LOG DATE 9-10-92 LOG TIME 1000  
 LOCATION ID 04mw-03  
 SAMPLE TYPE N-Resample SAMPLE ID 04mw-03-01

INITIAL GROUNDWATER DEPTH (FT) See initial log form  
 SAMPLING PERIOD: START 1040 COMPLETE 1050  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-7-92

COMMENTS Calibrate PH meter at site. OVM=0  
Resampling for 8015 and 8010

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.9</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>672</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-86</u>	
TEMPERATURE	TEMP	°C	<u>7.7</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>See initial log form.</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1000	0.0	--	--	--	START PUMPING
1025	10	6.6	670	7.7	
1030	15	6.7	676	7.7	
1035	17	6.9	680	7.8	
1040	18	6.9	672	7.7	

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	



# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID QW000 LOG DATE 9/22/92 LOG TIME 1635  
 LOCATION ID 05 MW01  
 SAMPLE TYPE N SAMPLE ID 05-MW-01-01

INITIAL GROUNDWATER DEPTH (FT) 22.75 ~~td=53.88~~  
 SAMPLING PERIOD: START 1635 COMPLETE \_\_\_\_\_  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9/23/92

COMMENTS \_\_\_\_\_

FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	_____	_____
SPECIFIC CONDUCTANCE	SC	μmhos/c	_____	_____
REDOX POTENTIAL	Eh	mvolts	_____	_____
TEMPERATURE	TEMP	°C	_____	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	_____	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
	0.0	--	--	--	START PUMPING
1530		6.3	500	1.3	Start purge
1541	5				* pH meter died
	10				- Unable to get any
	15				pH data.
	20				
	25				
	30				
1635	35				Sampled

SAMPLES TYPES: (WSACODE)

SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

Resample

GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 10-1-92 LOG TIME 1628  
 LOCATION ID 05 MW 01  
 SAMPLE TYPE N SAMPLE ID 05-MW-01-01  
resample

INITIAL GROUNDWATER DEPTH (FT) tot 53.88  
 SAMPLING PERIOD: START 1628 COMPLETE  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-2-92

COMMENTS Own Oppm B4, Oppm B2- No  
functioning. PH meter. Will purge 45 gallons

FINAL PARAMETER MEASUREMENTS:				COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	_____	_____
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	_____	_____
REDOX POTENTIAL	Eh	mvolts	_____	_____
TEMPERATURE	TEMP	$^{\circ}$ C	_____	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	_____	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1505	0.0	--	--	--	START PUMPING
1525	5				
1532	10				
1540	15				
1555	20				
1604	25				
1613	30				
1618	35				
1620	40				
1628	45				

SAMPLES TYPES: (WSACODE)

D - DUPLICATE FB - FIELD BLANK  
 R - REPLICATE TB - TRIP BLANK  
 S - SPIKE LB - LAB BLANK  
 K - KNOWN N - NORMAL

SAMPLE METHODS: (WSMCODE)

G - GRAB SP - SUBMERSIBLE PUMP  
 B - BAILER AL - AIR-LIFT SAMPLER  
 PP - PERISTALTIC PUMP BP - BLADDER PUMP  
 SL - SUCTION LIFT PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 001800 LOG DATE 9-13-92 LOG TIME 1810  
 LOCATION ID 05mw02  
 SAMPLE TYPE N SAMPLE ID 05mw02-01

INITIAL GROUNDWATER DEPTH (FT) 20.78 to 50.48  
 SAMPLING PERIOD: START 1755 COMPLETE 1815  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-14-92

COMMENTS Over out - to much moisture in air.

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.3</u>
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>333</u>
REDOX POTENTIAL	Eh	mvolts	<u>27</u>
TEMPERATURE	TEMP	$^{\circ}$ C	<u>1.3</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>488</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1710	0.0	--	--	--	START PUMPING
1720	8	6.2	326	2.0	
1730	15	6.3	333	1.0	
1740	25	6.3	330	1.3	
1750	35	6.3	333	1.3	Switch to Wexterra
1755	37				Start sampling.

## SAMPLES TYPES: (WSACODE)

D -	DUPLICATE	FB -	FIELD BLANK
R -	REPLICATE	TB -	TRIP BLANK
S -	SPIKE	LB -	LAB BLANK
K -	KNOWN	N -	NORMAL

## SAMPLE METHODS: (WSMCODE)

G -	GRAB	SP -	SUBMERSIBLE PUMP
B -	BAILER	AL -	AIR-LIFT SAMPLER
PP -	PERISTALTIC PUMP	BP -	BLADDER PUMP
SL -	SUCTION LIFT PUMP		

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 001000 LOG DATE 9/21/92 LOG TIME 1644  
 LOCATION ID 05 MW03  
 SAMPLE TYPE N SAMPLE ID 05-MW-03-01

INITIAL GROUNDWATER DEPTH (FT) 19.18 to 53.72  
 SAMPLING PERIOD: START 1644 COMPLETE     
 SAMPLING METHOD B LOGGER CODE Rad  
 LAB CODE RAS DATE SENT 9/22/92

COMMENTS 34°, cloudy. snow on ground.

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.0</u>	_____
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>527</u>	_____
REDOX POTENTIAL	Eh	mvolts	_____	_____
TEMPERATURE	TEMP	°C	<u>2.0</u>	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>788</u>	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
16000	0.0	--	--	--	START PUMPING
16011	5	7.9	397	1.2	
16017	10	7.5	424	1.7	
16021	15	7.2	439	1.7	
16029	20	7.1	517	1.9	
16035	25	7.0	524	2.0	
16038	30	7.0	527	2.0	
16044	39	7.0	527	2.0	

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE    FB - FIELD BLANK  
 R - REPLICATE    TB - TRIP BLANK  
 S - SPIKE        LB - LAB BLANK  
 K - KNOWN        N - NORMAL

G - GRAB  
 B - BAILER  
 PP - PERISTALIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 001002 LOG DATE 9/22/92 LOG TIME 1306  
 LOCATION ID 05mw-04  
 SAMPLE TYPE N SAMPLE ID 05mw0401

INITIAL GROUNDWATER DEPTH (FT) 18.71 to 49.20  
 SAMPLING PERIOD: START 1306 COMPLETE  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9/23/92

COMMENTS

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U. <u>6.1</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c <u>696</u>	
REDOX POTENTIAL	Eh	mvolts <u>-118</u>	
TEMPERATURE	TEMP	$^{\circ}$ C <u>1.1</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1209	0.0	--	--	--	START PUMPING
1232	5	7.0	731	1.2	product on water
1240	10	5.7	715	1.1	
1242	15	5.2	713	1.1	
1244	20	5.6	725	1.2	
1254	25	5.8	724	1.1	
1256	30	6.4	718	1.1	
1304	35	5.8	696	1.1	
1306	38	6.1	696	1.1	

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE	FB - FIELD BLANK
R - REPLICATE	TB - TRIP BLANK
S - SPIKE	LB - LAB BLANK
K - KNOWN	N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB	SP - SUBMERSIBLE PUMP
B - BAILER	AL - AIR-LIFT SAMPLER
PP - PERISTALTIC PUMP	BP - BLADDER PUMP
SL - SUCTION LIFT PUMP	

Resample

**GROUND WATER QUALITY SAMPLING RECORD**

PAGE 1

INSTALLATION ID Galena LOG DATE 10-1-92 LOG TIME 1225  
 LOCATION ID 05mw04  
 SAMPLE TYPE N SAMPLE ID 05mw0401

INITIAL GROUNDWATER DEPTH (FT) 20.55 to 49.20  
 SAMPLING PERIOD: START 1225 COMPLETE 1227  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-2-92

COMMENTS Oum = 1.7 ppm BH, 032.

FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	_____	_____
SPECIFIC CONDUCTANCE	SC	μmhos/c	_____	_____
REDOX POTENTIAL	Eh	mvolts	_____	_____
TEMPERATURE	TEMP	°C	_____	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	_____	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1115	0.0	--	--	--	START PUMPING
1130	10	6.7*			meter not working unable to get readings
1138	18				
1150	25				
1205	40				
1225					sampled.

SAMPLES TYPES: (WSACODE)

SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 04102 LOG DATE 9-21-92 LOG TIME 1127  
 LOCATION ID 05mw-05  
 SAMPLE TYPE N SAMPLE ID 05-mw-05-01

INITIAL GROUNDWATER DEPTH (FT) \_\_\_\_\_  
 SAMPLING PERIOD: START 1127 COMPLETE \_\_\_\_\_  
 SAMPLING METHOD B LOGGER CODE Rad  
 LAB CODE RAS DATE SENT 9-22-92

COMMENTS OUM=0

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.9</u>
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>659</u>
REDOX POTENTIAL	Eh	mvolts	_____
TEMPERATURE	TEMP	$^{\circ}$ C	<u>0.7</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>900</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
	0.0	--	--	--	START PUMPING
* 1057	5	6.9	653	0.7	
1102	10	7.0	661	0.8	
1107	15	6.8	683	0.8	
1111	20	6.8	683	0.7	
1115	25	6.9	678	0.7	
1120	30	6.9	669	0.7	
1127	36	6.9	659	0.7	
* Obvious dense product in BBL.					

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE FB - FIELD BLANK  
 R - REPLICATE TB - TRIP BLANK  
 S - SPIKE LB - LAB BLANK  
 K - KNOWN N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB SP - SUBMERSIBLE PUMP  
 B - BAILER AL - AIR-LIFT SAMPLER  
 PP - PERISTALTIC PUMP BP - BLADDER PUMP  
 SL - SUCTION LIFT PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID QALERA LOG DATE 9-20-92 LOG TIME 1645  
 LOCATION ID 05 MW 010  
 SAMPLE TYPE N SAMPLE ID 05 MW 010 01

INITIAL GROUNDWATER DEPTH (FT) 110.61 to 49.46  
 SAMPLING PERIOD: START 1645 COMPLETE \_\_\_\_\_  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-21-92

COMMENTS \_\_\_\_\_

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.7</u>	_____
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>622</u>	_____
REDOX POTENTIAL	Eh	mvolts	<u>93</u>	_____
TEMPERATURE	TEMP	$^{\circ}$ C	<u>3.1</u>	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>716</u>	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
	0.0	--	--	--	START PUMPING
1615	9	5.2	678	3.8	
1625	18	6.3	605	3.5	
1636	27	6.7	633	3.2	
1645	37	6.7	622	3.1	

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE      FB - FIELD BLANK  
 R - REPLICATE      TB - TRIP BLANK  
 S - SPIKE          LB - LAB BLANK  
 K - KNOWN          N - NORMAL

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP



# Resample

## GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 091092 LOG DATE 10-1-92 LOG TIME 1200  
 LOCATION ID 05 mw 0.6  
 SAMPLE TYPE N SAMPLE ID 05 mw 00-01  
Resample

INITIAL GROUNDWATER DEPTH (FT) 18.48 to 49.00  
 SAMPLING PERIOD: START 1200 COMPLETE 1215  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-2-92

COMMENTS 0.0m = 2.0 BH, 0 BZ. set pH meter to 7.0 at 1100.

### FINAL PARAMETER MEASUREMENTS:

### COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	_____	_____
SPECIFIC CONDUCTANCE	SC	μmhos/c	_____	_____
REDOX POTENTIAL	Eh	mvolts	_____	_____
TEMPERATURE	TEMP	°C	_____	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	_____	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1100	0.0	--	--	--	START PUMPING
1110	5	6.4	640	3.2	pH meter not working.
1115	10			3.2	will continue to
1140	25				purge 35+ gal.
1145	30				will sample now-
1200	40				No Readings.

### SAMPLES TYPES: (WSACODE)

D - DUPLICATE FB - FIELD BLANK  
 R - REPLICATE TB - TRIP BLANK  
 S - SPIKE LB - LAB BLANK  
 K - KNOWN N - NORMAL

### SAMPLE METHODS: (WSMCODE)

G - GRAB SP - SUBMERSIBLE PUMP  
 B - BAILER AL - AIR-LIFT SAMPLER  
 PP - PERISTALTIC PUMP BP - BLADDER PUMP  
 SL - SUCTION LIFT PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 001002 LOG DATE 9-13-92 LOG TIME 1500  
 LOCATION ID 05 MW07  
 SAMPLE TYPE N SAMPLE ID 05 MW0701

INITIAL GROUNDWATER DEPTH (FT) 17.78 to 28.35  
 SAMPLING PERIOD: START 1450 COMPLETE 1500  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-14-92

COMMENTS Rain, cooler - almost sleet  
ms/msd taken

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>10.4</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/cm	<u>6910</u>	
REDOX POTENTIAL	Eh	mvolts	<u>099</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>1.7</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>1056.0</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1420	0.0	--	--	--	START PUMPING
1425	3	8.2	680	1.8	
1430	6	9.7	687	1.7	pH meter possibly fouling
1434	9	9.7	703	1.7	
1440	12	10.1	698	1.7	
1445	15	10.4	698	1.7	
1449	17	10.9	696	1.7	Switched to water

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID galena LOG DATE 9-13-92 LOG TIME 1225  
 LOCATION ID 05mw08  
 SAMPLE TYPE N SAMPLE ID 05mw080

INITIAL GROUNDWATER DEPTH (FT) 110.39  
 SAMPLING PERIOD: START 1230 COMPLETE 1240  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-14-92

COMMENTS Over wet - no readings

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.8</u>
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>541</u>
REDOX POTENTIAL	Eh	mvolts	<u>101</u>
TEMPERATURE	TEMP	°C	<u>4.0</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>710</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1145	0.0	--	--	--	START PUMPING
1155	3	6.4	547	3.10	
1205	6	6.4	555	3.6	
1215	12	6.6	552	4.1	
1220	14	6.8	535	4.0	
1225	16	6.8	541	4.0	

## SAMPLES TYPES: (WSACODE)

D -	DUPLICATE	FB -	FIELD BLANK
R -	REPLICATE	TB -	TRIP BLANK
S -	SPIKE	LB -	LAB BLANK
K -	KNOWN	N -	NORMAL

## SAMPLE METHODS: (WSMCODE)

G -	GRAB	SP -	SUBMERSIBLE PUMP
B -	BAILER	AL -	AIR-LIFT SAMPLER
PP -	PERISTALTIC PUMP	BP -	BLADDER PUMP
SL -	SUCTION LIFT PUMP		

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 0410M LOG DATE 9-13-92 LOG TIME 1100  
 LOCATION ID 05 mw 09  
 SAMPLE TYPE N SAMPLE ID 05 mw 09 01

INITIAL GROUNDWATER DEPTH (FT) 18.92 to 28.03  
 SAMPLING PERIOD: START 1100 COMPLETE 1125  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-14-92

COMMENTS duplicate 05-DS-08 collected  
at 05 mw 09.

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.0</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>492</u>	
REDOX POTENTIAL	Eh	mvolts	<u>157</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>1.6</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>2910</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1020	0.0	--	--	--	START PUMPING
1030	4	7.2	512	1.8	
1036	6	7.6	500	1.6	
1040	8	7.0	499	1.6	
1046	10	7.0	490	1.6	
1049	11	7.0	492	1.6	
1049	-				Switched to water.

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 001000 LOG DATE 9-13-92 LOG TIME 1100  
 LOCATION ID 05 MW-09  
 SAMPLE TYPE D SAMPLE ID 05 DS-08

INITIAL GROUNDWATER DEPTH (FT) 18.92  
 SAMPLING PERIOD: START 1100 COMPLETE 1125  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-14-92

COMMENTS

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.0</u>
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>492.0</u>
REDOX POTENTIAL	Eh	mvolts	<u>157.0</u>
TEMPERATURE	TEMP	$^{\circ}$ C	<u>1.6</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>1020.6</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
	0.0	--	--	--	START PUMPING

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE	FB - FIELD BLANK
R - REPLICATE	TB - TRIP BLANK
S - SPIKE	LB - LAB BLANK
K - KNOWN	N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB	SP - SUBMERSIBLE PUMP
B - BAILER	AL - AIR-LIFT SAMPLER
PP - PERISTALTIC PUMP	BP - BLADDER PUMP
SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 9-13-92 LOG TIME 1405  
 LOCATION ID OS MW-10  
 SAMPLE TYPE WLG SAMPLE ID OS MW-10-01

INITIAL GROUNDWATER DEPTH (FT) 19.99 td=30.00  
 SAMPLING PERIOD: START 1405 COMPLETE 1415  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-14-92

COMMENTS temp 38°F - Rain

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.7</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>504</u>	
REDOX POTENTIAL	Eh	mvolts	<u>009</u>	
TEMPERATURE	TEMP	°C	<u>2.1</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>728</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1325	0.0	--	--	--	START PUMPING
1330	3	6.8	478	2.8	
1338	5	6.4	500	2.1	
1343	7	6.5	501	2.1	
1348	9	6.6	503	2.1	
1354	12	6.7	504	2.1	Switched to water

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 001002 LOG DATE 9/23/92 LOG TIME 1110  
 LOCATION ID 05mw11  
 SAMPLE TYPE N SAMPLE ID 05mw-11-01

INITIAL GROUNDWATER DEPTH (FT) 21.5 to 28.17  
 SAMPLING PERIOD: START 1110 COMPLETE  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9/24/92

COMMENTS

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U. <u>6.8</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c <u>1283</u>	
REDOX POTENTIAL	Eh	mvolts	
TEMPERATURE	TEMP	$^{\circ}$ C <u>0.4</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l <u>880</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1047	0.0	--	--	--	START PUMPING
1053	1.5	6.9	1423	0.7	
1050	3.0	6.9	1313	0.5	
1059	4.5	6.9	1306	0.5	
1103	6.0	6.8	1280	0.2	
1105	8.0	6.8	1283	0.4	
1110					Sampled

## SAMPLES TYPES: (WSACODE)

D -	DUPLICATE	FB -	FIELD BLANK
R -	REPLICATE	TB -	TRIP BLANK
S -	SPIKE	LB -	LAB BLANK
K -	KNOWN	N -	NORMAL

## SAMPLE METHODS: (WSMCODE)

G -	GRAB	SP -	SUBMERSIBLE PUMP
B -	BAILER	AL -	AIR-LIFT SAMPLER
PP -	PERISTALTIC PUMP	BP -	BLADDER PUMP
SL -	SUCTION LIFT PUMP		

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 091090 LOG DATE 9/23/92 LOG TIME 1345  
 LOCATION ID 05-mw-12  
 SAMPLE TYPE N SAMPLE ID 05-mw-12-01

INITIAL GROUNDWATER DEPTH (FT) 19.38 ~~24.98~~  
 SAMPLING PERIOD: START 1345 COMPLETE  
 SAMPLING METHOD B LOGGER CODE Rad  
 LAB CODE RAS DATE SENT 9/24/92

COMMENTS

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	_____	_____
SPECIFIC CONDUCTANCE	SC	μmhos/c	_____	_____
REDOX POTENTIAL	Eh	mvolts	_____	_____
TEMPERATURE	TEMP	°C	_____	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>824</u>	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1315	0.0	--	--	--	START PUMPING
1325	1	7.0	1050	0.7	Purged dry
1331	2	6.0	1204	1.1	
1336	4	6.7	1201	1.3	
1337	5	6.7	1245	1.3	
1339	6	6.2	1258	1.4	
1342	7	6.8	1245	1.4	
1345	9	6.6	1224	1.4	Sampled

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP



# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Q0100 LOG DATE 9-27-92 LOG TIME 1457  
 LOCATION ID 06mw01  
 SAMPLE TYPE N SAMPLE ID 06mw01 01

INITIAL GROUNDWATER DEPTH (FT) 2404 Ed-5294  
 SAMPLING PERIOD: START 1457 COMPLETE 1512  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-28-92

COMMENTS 15° ambient temp.

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.7</u>
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>1728</u>
REDOX POTENTIAL	Eh	mvolts	<u>-039</u>
TEMPERATURE	TEMP	°C	<u>5.5</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>1072</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1415	0.0	-	-	-	START PUMPING
1420	5	6.9	1645	5.3	
1430	10	6.8	1668	5.5	
1434	15	6.7	1691	5.3	
1441	20	6.8	1740	5.5	
1449	25	6.7	1771	5.4	
1457	33	6.7	1728	5.5	-39 mv sampled

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 001000 LOG DATE 9-27-92 LOG TIME 1020  
 LOCATION ID 06-mw02  
 SAMPLE TYPE N SAMPLE ID 06mw0201

INITIAL GROUNDWATER DEPTH (FT) 20.92 to 51.90  
 SAMPLING PERIOD: START 1020 COMPLETE 1050  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-28-92

COMMENTS 59° ambient

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.8</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c.	<u>1330</u>	
REDOX POTENTIAL	Eh	mvolts		
TEMPERATURE	TEMP	°C	<u>4.0</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>812</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
0941	0.0	--	--	--	START PUMPING
0947	5	7.3	1597	4.0	
0952	10	6.8	1491	3.8	
0958	15	6.8	1403	4.2	
1003	20	7.2	1410	3.9	
1009	25	6.8	1375	3.7	
1014	30	6.7	1400	4.1	
1020	35	6.8	1330	4.0	Sampled

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 00100 LOG DATE 9-8-92 LOG TIME 1730  
 LOCATION ID 010mw03  
 SAMPLE TYPE N SAMPLE ID 010mw0301

INITIAL GROUNDWATER DEPTH (FT) 15.77 ~~15.77~~ 48.70  
 SAMPLING PERIOD: START 1730 COMPLETE 1740  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-9-92

COMMENTS wind from dump - odor of burning plastic.

## FINAL PARAMETER MEASUREMENTS:

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.5*</u>	COMMENTS
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>873</u>	
REDOX POTENTIAL	Eh	mvolts	<u>62</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>4.8</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>008*</u>	<u>out of acid 9-8-92</u>

\*ran on 9-9-92

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
11030	0.0	--	--	--	START PUMPING
11045	5	-	857	5.1	PH probe will not cal.
11052	10	-	845	5.0	
11057	15	-	851	5.0	
11059	20	-	851	4.9	
1702	25	-	855	4.8	
1708	30	-	864	4.8	
1714	37	-	865	4.6	Switched to water
1729	38	-	873	4.8	Ready to Sample.

## SAMPLES TYPES: (WSACODE)

D -	DUPLICATE	FB -	FIELD BLANK
R -	REPLICATE	TB -	TRIP BLANK
S -	SPIKE	LB -	LAB BLANK
K -	KNOWN	N -	NORMAL

## SAMPLE METHODS: (WSMCODE)

G -	GRAB	SP -	SUBMERSIBLE PUMP
B -	BAILER	AL -	AIR-LIFT SAMPLER
PP -	PERISTALTIC PUMP	BP -	BLADDER PUMP
SL -	SUCTION LIFT PUMP		

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 9-8-92 LOG TIME 1745  
 LOCATION ID 010 mw03  
 SAMPLE TYPE D SAMPLE ID 000008

INITIAL GROUNDWATER DEPTH (FT) 15.77  
 SAMPLING PERIOD: START 1745 COMPLETE 1755  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-9-92

COMMENTS

burning plastic odor from dump.

## FINAL PARAMETER MEASUREMENTS:

POTENTIAL OF HYDROGEN

pH

S.U.

7.3\*

COMMENTS

pH used on 9-9-92

SPECIFIC CONDUCTANCE

SC

$\mu$ mhos/c

873

w/ new batteries

REDOX POTENTIAL

Eh

mvolts

62

in meter.

TEMPERATURE

TEMP

°C

4.8

ALKALINITY (CaCO<sub>3</sub>)

ALK

mg/l

654

out of acid 9-8-92

Ran on 9-9-92

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP (°C)	COMMENTS
	0.0	--	--	--	START PUMPING
	See 010 mw 03 for log sheet.				

\* Calibration questionable.

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE      FB - FIELD BLANK  
 R - REPLICATE      TB - TRIP BLANK  
 S - SPIKE      LB - LAB BLANK  
 K - KNOWN      N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB      SP - SUBMERSIBLE PUMP  
 B - BAILER      AL - AIR-LIFT SAMPLER  
 PP - PERISTALTIC PUMP      BP - BLADDER PUMP  
 SL - SUCTION LIFT PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Qalena LOG DATE 9-29-92 LOG TIME 1543  
 LOCATION ID 06mw04  
 SAMPLE TYPE N SAMPLE ID 06mw0401

INITIAL GROUNDWATER DEPTH (FT) 16.44 to 48.66  
 SAMPLING PERIOD: START 1543 COMPLETE  
 SAMPLING METHOD B LOGGER CODE Rad  
 LAB CODE RAS DATE SENT 9-30-92

COMMENTS Submersible pump is not working. Remaining well (including this one) must be hand pumped.

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.7</u>
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>1645</u>
REDOX POTENTIAL	Eh	mvolts	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>4.6</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>772</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1448	0.0	--	--	--	START PUMPING
1514	5	10.6	11630	5.2	visible product.
1516	10	10.4	11678	5.2	
1522	15	10.4	11681	5.2	
1525	20	10.5	11674	5.2	
1533	25	10.5	11650	5.0	
1537	30	10.6	11650	5.0	
1543	36	10.7	11645	4.6	-96mv sampled

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID galena LOG DATE 9-27-92 LOG TIME 1200  
 LOCATION ID 06mw0601  
 SAMPLE TYPE N SAMPLE ID 06mw0601

INITIAL GROUNDWATER DEPTH (FT) 21.80 to 29.97  
 SAMPLING PERIOD: START 1200 COMPLETE 1220  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-28-92

COMMENTS

10°f ambient temp.

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.7</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>1296</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-079</u>	
TEMPERATURE	TEMP	°C	<u>3.5</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>852</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1148	0.0	--	--	--	START PUMPING
1151	1.5	6.7	1242	2.6	
1153	3.0	6.7	1260	3.2	
1154	4.5	6.7	1282	3.4	
1156	6.0	6.7	1257	3.4	
1158	7.5	6.7	1291	3.4	
1200	10.0	6.7	1296	3.5	-79 ml sampled.

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Campion LOG DATE 8-31-92 LOG TIME 1430  
 LOCATION ID 07mw01  
 SAMPLE TYPE N SAMPLE ID 07mw01 01

INITIAL GROUNDWATER DEPTH (FT) 3.60 td: 15.24  
 SAMPLING PERIOD: START 1505 COMPLETE 1600  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-1-92

COMMENTS 0vm • 0ppm.

## FINAL PARAMETER MEASUREMENTS:

				COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.9</u>	* meter out of cal.
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>753</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-34</u>	
TEMPERATURE	TEMP	°C	<u>2.4</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>1025</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1430	0.0	--	--	--	START PUMPING
1440	2	8.8	737	2.3	dry after - 2 gal.
1450	3				dry after 1 more gal.
1500	4	8.8	753	2.4	
1505					Sampling

SAMPLES TYPES: (WSACODE)

SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

\* pH meter malfunctioning. took 8 headspace sample + kept it ~~ice~~ cold.  
 pH measurement not at all off. Sample about 7.9-8.0

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Campion LOG DATE 8-31-92 LOG TIME 1100S  
 LOCATION ID 07mw01  
 SAMPLE TYPE D SAMPLE ID 07-DS-09

INITIAL GROUNDWATER DEPTH (FT) 3.106 td=15.24  
 SAMPLING PERIOD: START 1645 COMPLETE 1100S  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-1-92

COMMENTS duplicate readings for duplicate sample.

## FINAL PARAMETER MEASUREMENTS:

POTENTIAL OF HYDROGEN

pH

S.U.

8.00

COMMENTS

\*PH meter malfunctioning

SPECIFIC CONDUCTANCE

SC

$\mu$ mhos/c

691

REDOX POTENTIAL

Eh

mvolts

-86

TEMPERATURE

TEMP

$^{\circ}$ C

3.3

ALKALINITY (CaCO<sub>3</sub>)

ALK

mg/l

1030

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
	0.0	--	--	--	START PUMPING
1100S	18	10.5?	691	3.3	PH meter malfunctioning

SAMPLES TYPES: (WSACODE)

SAMPLE METHODS: (WSMCODE)

D - DUPLICATE

FB -

FIELD BLANK

G -

GRAB

SP -

SUBMERSIBLE PUMP

R - REPLICATE

TB -

TRIP BLANK

B -

BAILER

AL -

AIR-LIFT SAMPLER

S - SPIKE

LB -

LAB BLANK

PP -

PERISTALTIC PUMP

BP -

BLADDER PUMP

K - KNOWN

N -

NORMAL

SL -

SUCTION LIFT PUMP

\*PH meter malfunctioning. took a headspace sample and kept it cold.  
 pH measurement at office same day: 7.9-8.0.

E-217



# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Campion LOG DATE 9-6-92 LOG TIME 1015  
 LOCATION ID 07mw01  
 SAMPLE TYPE N, D SAMPLE ID 07mw0101 and 0705-09  


---

 INITIAL GROUNDWATER DEPTH (FT) 4.21 to 11.78  
 SAMPLING PERIOD: START 1730 COMPLETE 1800  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-7-92

COMMENTS  
QUM#249 = 0.0ppm at 1000. pH meter #91.  
Resampling this well - see original ground water quality sampling record for additional information.

FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>10.8</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>1015</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-75</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>3.1</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>See original sheet.</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
11015	0.0	--	--	--	START PUMPING
11022	2	6.5	1028	4.0	well draws down rapidly
11030	4	7.0	594	3.4	same as above.
11040	6	10.9	1003	3.5	
11050	8	6.9	1054	4.0	
11700	10	6.8	1017	3.3	
11700	12	6.8	1035	3.1	
11719	14.5	6.8	1015	3.1	

SAMPLES TYPES: (WSACODE)

SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Campion LOG DATE 9-1-92 LOG TIME 1225  
 LOCATION ID 07mw02  
 SAMPLE TYPE N SAMPLE ID 07mw0201

INITIAL GROUNDWATER DEPTH (FT) 2.15 to 22.74  
 SAMPLING PERIOD: START 1430 COMPLETE 1450  
 SAMPLING METHOD B LOGGER CODE 2AD  
 LAB CODE RAS DATE SENT 9-2-92

COMMENTS  
Shoer on surface water  
Around well. 0.0m OBH/OBZ.

## FINAL PARAMETER MEASUREMENTS:

POTENTIAL OF HYDROGEN

pH

S.U.

7.5

COMMENTS  
used 1327 value;  
meter clipped.

SPECIFIC CONDUCTANCE

SC

$\mu$ mhos/c

908

1450

REDOX POTENTIAL

Eh

mvolts

-1101

TEMPERATURE

TEMP

$^{\circ}$ C

2.7

used 1327 value; water  
warmed during sampling.

ALKALINITY (CaCO<sub>3</sub>)

ALK

mg/l

740

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1225	0.0	--	--	--	START PUMPING
1240	5	7.3	843	2.1	
1259	10	7.1	871	2.4	turbid - grey in color
1318	15	7.5	860	3.0	
1327	20	7.5	844	2.7	Rain; sample start 1430
1450	22	10.6	918	5.8	* values not used in final
1540		7.9	869	4.4	dup sample started.

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN  
 FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP  
 SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Campion LOG DATE 9-1-92 LOG TIME 1225  
 LOCATION ID 07mw02  
 SAMPLE TYPE D SAMPLE ID 070510

INITIAL GROUNDWATER DEPTH (FT) 2.15 to 22.74  
 SAMPLING PERIOD: START 1540 COMPLETE 1600  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-9-92

COMMENTS Shoen On surface water around  
Well . 0vm . 0B4 / 0B2.

## FINAL PARAMETER MEASUREMENTS:

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.8</u>	COMMENTS <u>see 07mw02 (cm) &gt; 7.5</u>
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>857</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-84</u>	
TEMPERATURE	TEMP	°C	<u>2.7</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>750</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
	0.0	-	-	-	START PUMPING
<u>1540</u>	<u>0</u>	<u>7.9</u>	<u>918</u>	<u>4.4</u>	<u>*questionable pit-</u>
<u>1550</u>	<u>3.0</u>	<u>6.8</u>	<u>857</u>	<u>2.7</u>	<u>warmed by sun.</u>

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Campion LOG DATE 9-1-92 LOG TIME 1215  
 LOCATION ID 07mw03  
 SAMPLE TYPE N SAMPLE ID 07mw0301

INITIAL GROUNDWATER DEPTH (FT) 3.19 td: 17.06  
 SAMPLING PERIOD: START 1400 COMPLETE 1425  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-2-92

COMMENTS QVM-12 BH; <1 B2.  
1345 PH cal. check 7:7.0 4:4.0

FINAL PARAMETER MEASUREMENTS:				COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.4</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>827</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-88</u>	
TEMPERATURE	TEMP	°C	<u>2.1</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>770</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1215	0.0	--	--	--	START PUMPING
1233	5	7.1	767	2.1	
1300	10	6.7	875	2.4	Rain showers - quit
1350	15	7.4	798	2.6	purging ~15 min.
1358	18	11.7*	827	2.9	* pH junction problem
					Clogged.

SAMPLES TYPES: (WSACODE)

D - DUPLICATE	FB - FIELD BLANK
R - REPLICATE	TB - TRIP BLANK
S - SPIKE	LB - LAB BLANK
K - KNOWN	N - NORMAL

SAMPLE METHODS: (WSMCODE)

G - GRAB	SP - SUBMERSIBLE PUMP
B - BAILER	AL - AIR-LIFT SAMPLER
PP - PERISTALTIC PUMP	BP - BLADDER PUMP
SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Campion LOG DATE 9-1-92 LOG TIME 1115  
 LOCATION ID 07mw04  
 SAMPLE TYPE N SAMPLE ID 07mw0401

INITIAL GROUNDWATER DEPTH (FT) 21.23 td=5508  
 SAMPLING PERIOD: START 1300 COMPLETE 1325  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-2-92

COMMENTS OVM=07pm. 1115 - Recalibrate  
pH meter, buffer 7 to 7.0, buffer 4 to 4.0.

FINAL PARAMETER MEASUREMENTS:			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.0</u>
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>715</u>
REDOX POTENTIAL	Eh	mvolts	<u>-106</u>
TEMPERATURE	TEMP	$^{\circ}$ C	<u>1.7</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>725</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1115	0.0	--	--	--	START PUMPING
1125	5	6.6	756	2.3	
1132	10	7.0	746	1.7	
1140	15	5.3	733	1.6	
1152	20	6.7	740	1.6	
1209	25	7.1	734	1.5	
1219	30	5.4	746	1.5	recheck pH meter cal.
1230	35	7.0	705	1.7	
1245	40	7.0	715	1.7	
1300	-				Sample.

SAMPLES TYPES: (WSACODE)

D -	DUPLICATE	FB -	FIELD BLANK
R -	REPLICATE	TB -	TRIP BLANK
S -	SPIKE	LB -	LAB BLANK
K -	KNOWN	N -	NORMAL

SAMPLE METHODS: (WSMCODE)

G -	GRAB	SP -	SUBMERSIBLE PUMP
B -	BAILER	AL -	AIR-LIFT SAMPLER
PP -	PERISTALTIC PUMP	BP -	BLADDER PUMP
SL -	SUCTION LIFT PUMP		

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID QALERA LOG DATE 9-8-92 LOG TIME 1430  
 LOCATION ID 09mw01  
 SAMPLE TYPE N SAMPLE ID 09mw01-01

INITIAL GROUNDWATER DEPTH (FT) 13.92 td=47.42  
 SAMPLING PERIOD: START 1430 COMPLETE 1450  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-9-92

COMMENTS am 0.0 ppm BH. Wind from east;  
Intermittent odor of burning plastic during sampling. Oil stained  
Soil 10' north of well.

## FINAL PARAMETER MEASUREMENTS:

POTENTIAL OF HYDROGEN pH S.U. 7.3\*  
 SPECIFIC CONDUCTANCE SC  $\mu$ mhos/c 830  
 REDOX POTENTIAL Eh mvolts -0.01  
 TEMPERATURE TEMP  $^{\circ}$ C 5.1  
 ALKALINITY (CaCO<sub>3</sub>) ALK mg/l 572

## COMMENTS

pH = 12.4 and 9.9-92  
-new batteries  
in meter

\*calibration questionable

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1315	0.0	--	--	--	START PUMPING
	5	-	-	-	pH probe will not cal.
1331	10	-	752	5.3	
1335	15	-	742	5.0	
1343	20	-	746	4.8	
1350	25	-	791	5.0	
1359	30	-	826	5.1	
1401	35	-	814	4.9	
1403	38	-	807	5.0	
1422	40	-	874	5.4	

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE FB - FIELD BLANK  
 R - REPLICATE TB - TRIP BLANK  
 S - SPIKE LB - LAB BLANK  
 K - KNOWN N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB SP - SUBMERSIBLE PUMP  
 B - BAILER AL - AIR-LIFT SAMPLER  
 PP - PERISTALTIC PUMP BP - BLADDER PUMP  
 SL - SUCTION LIFT PUMP

PAGE 2

LOCATION ID 09 MW 01

[illegible]

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 09-mw-01 LOG DATE 9-8-92 LOG TIME 1430  
 LOCATION ID 09-mw-01  
 SAMPLE TYPE D SAMPLE ID 09-DS-07

INITIAL GROUNDWATER DEPTH (FT) 13.92  
 SAMPLING PERIOD: START 1430 COMPLETE 1450  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-9-92

COMMENTS 0.1m - 0.0 ppm Bt. Intermittent burning plastic odor from dump. 0.1 stained soil 10' n of well

## FINAL PARAMETER MEASUREMENTS:

POTENTIAL OF HYDROGEN

pH

S.U.

7.6\*

## COMMENTS

pH = 7.04 on 9-9-92

SPECIFIC CONDUCTANCE

SC

$\mu$ mhos/c

830

w/ new batteries

REDOX POTENTIAL

Eh

mvolts

-0.01

in meter.

TEMPERATURE

TEMP

°C

5.1

ALKALINITY (CaCO<sub>3</sub>)

ALK

mg/l

56.6

\*meter calibration questionable.

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP (°C)	COMMENTS
1315	0.0	--	--	--	START PUMPING
	See purge log for 09-mw-01-01				

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE FB - FIELD BLANK  
 R - REPLICATE TB - TRIP BLANK  
 S - SPIKE LB - LAB BLANK  
 K - KNOWN N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP



# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Qalena LOG DATE 9-29-92 LOG TIME 1050  
 LOCATION ID 09mw02  
 SAMPLE TYPE N SAMPLE ID 09-mw-02-01

INITIAL GROUNDWATER DEPTH (FT) 15.18 to 45.07  
 SAMPLING PERIOD: START 1050 COMPLETE \_\_\_\_\_  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-30-92

COMMENTS hard pumped purge volume = 34 gal

FINAL PARAMETER MEASUREMENTS: COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.3</u>	_____
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/cm	<u>1079</u>	_____
REDOX POTENTIAL	Eh	mvolts	_____	_____
TEMPERATURE	TEMP	$^{\circ}$ C	<u>2.0</u>	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>420</u>	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1015	0.0	--	--	--	START PUMPING
1035	15	7.9	1227	3.6	for 5 and 10 gas. pH meter not functioning properly.
1041	20	7.5	1125	2.9	
1046	25	7.4	1105	2.3	
1050	30	7.3	1092	2.8	- 50ml Sampled.
1054	34	7.3	1079	2.0	

SAMPLES TYPES: (WSACODE)

SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 0010m LOG DATE 9-15-92 LOG TIME 1415  
 LOCATION ID 09mw03  
 SAMPLE TYPE N SAMPLE ID 09mw03-01

INITIAL GROUNDWATER DEPTH (FT) 15.81 bw=47.24  
 SAMPLING PERIOD: START 1353 COMPLETE \_\_\_\_\_  
 SAMPLING METHOD B LOGGER CODE Rad  
 LAB CODE RAS DATE SENT 9-16-92

COMMENTS Ambient temp near 20°f.

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.8</u>	_____
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>454</u>	_____
REDOX POTENTIAL	Eh	mvolts	<u>-042</u>	_____
TEMPERATURE	TEMP	°C	<u>2.3</u>	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>536</u>	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1	0.0	--	--	--	START PUMPING
1245	6	6.8	144	2.3	
1300	12	6.8	468	2.4	
1315	18	6.8	471	2.6	
1337	24	6.8	458	2.2	
1345	30	6.8	454	2.3	
1353	36	6.8	454	2.3	Sampled.

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID QALena LOG DATE 9-15-92 LOG TIME 1415  
 LOCATION ID 09mw03  
 SAMPLE TYPE D SAMPLE ID 09-05-08

INITIAL GROUNDWATER DEPTH (FT) 15.81 14.47-21  
 SAMPLING PERIOD: START 1353 COMPLETE  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-16-92

COMMENTS Ambient air temp - 20°F.

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>10.8</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>454</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-42</u>	
TEMPERATURE	TEMP	°C	<u>2.3</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>1984</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
	0.0	--	--	--	START PUMPING

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Qavena LOG DATE 9-9-92 LOG TIME 1815  
 LOCATION ID 09mw04  
 SAMPLE TYPE N SAMPLE ID 09mw0401

INITIAL GROUNDWATER DEPTH (FT) 17.05 to 47.53  
 SAMPLING PERIOD: START 1815 COMPLETE 1830  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-10-92

COMMENTS 32° clear, breezy

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.7</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/cm	<u>859</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-012</u>	
TEMPERATURE	TEMP	°C	<u>2.7</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>680</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1745	0.0	-	-	-	START PUMPING
1749	5	6.7	681	2.8	clear
1759	10	6.7	850	2.6	
1802	15	6.6	855	2.7	
1806	20	6.7	855	2.6	
1809	25	6.7	853	2.7	
1812	30	6.6	864	2.6	
1815	35	6.7	859	2.7	

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 9-16-92 LOG TIME 1115  
 LOCATION ID 09mw05  
 SAMPLE TYPE N SAMPLE ID 09mw-05-01

INITIAL GROUNDWATER DEPTH (FT) 13.90 to 14.10  
 SAMPLING PERIOD: START 1105 COMPLETE 1120  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-17-92

COMMENTS Overcast. Ambient air temp 15°F - dropping.

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.8</u>
SPECIFIC CONDUCTANCE	SC	μmhos/cm	<u>449</u>
REDOX POTENTIAL	Eh	mvolts	<u>-043</u>
TEMPERATURE	TEMP	°C	<u>1.8</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>444</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1030	0.0	--	--	--	START PUMPING
1034	5	7.1	444	1.6	
1042	20	6.6	451	1.8	
1045	25	6.7	450	1.8	
1055	30	6.7	450	1.8	
1058	35	6.8	450	1.8	
1100	38	6.5	449	1.5	Switched to water.

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN

FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID QAL000 LOG DATE 9-16-92 LOG TIME 1430  
 LOCATION ID 09mw000  
 SAMPLE TYPE N SAMPLE ID 09-mw-00-01

INITIAL GROUNDWATER DEPTH (FT) 12.03 to 40.84  
 SAMPLING PERIOD: START 1430 COMPLETE 1450  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-17-92

COMMENTS Overcast, cold, 30°

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>10.8</u>	_____
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>260</u>	_____
REDOX POTENTIAL	Eh	mvolts	<u>074</u>	_____
TEMPERATURE	TEMP	°C	<u>2.0</u>	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>452</u>	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
	0.0	--	--	--	START PUMPING
1410	10	10.8	278	2.0	
1415	20	10.8	267	2.0	
1420	30	10.8	264	2.0	
1425	39	10.8	260	2.0	

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Qalena LOG DATE 9-15-92 LOG TIME 1725  
 LOCATION ID 09mw07  
 SAMPLE TYPE N SAMPLE ID 09mw07-01

INITIAL GROUNDWATER DEPTH (FT) 15.00 to 23.74  
 SAMPLING PERIOD: START 1725 COMPLETE  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-16-92

COMMENTS

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>10.9</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>457</u>	
REDOX POTENTIAL	Eh	mvolts	<u>40</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>1.7</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>1032</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
11050	0.0	--	--	--	START PUMPING
11054	5	7.1	431	2.0	Sub. pump impellers frozen had to throw out to purge
	10	6.8	458	1.6	
	15	6.9	459	1.7	
	20	6.9	457	1.7	Switched to waterline.

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Qavera LOG DATE 9-30-92 LOG TIME 1140  
 LOCATION ID 09-mw-08  
 SAMPLE TYPE N SAMPLE ID 09-mw-08-01

INITIAL GROUNDWATER DEPTH (FT) 26.10 to 28.44  
 SAMPLING PERIOD: START 1140 COMPLETE 1210  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-1-92

COMMENTS Ovm-18.0 BH #1.0 BZ- Snowing- UOA'S very hard to sample.

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN

pH

S.U.

6.9

SPECIFIC CONDUCTANCE

SC

μmhos/c

623

REDOX POTENTIAL

Eh

mvolts

-114

TEMPERATURE

TEMP

°C

3.0

ALKALINITY (CaCO<sub>3</sub>)

ALK

mg/l

972

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1110	0.0	--	--	--	START PUMPING
1110	1	7.0	618	3.1	well dry-allowing to recharge
1125	3	6.9	629	3.0	"
1132	4.5	6.9	623	3.0	"
1140					sampled

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE  
 R - REPLICATE  
 S - SPIKE  
 K - KNOWN  
 FB - FIELD BLANK  
 TB - TRIP BLANK  
 LB - LAB BLANK  
 N - NORMAL

G - GRAB  
 B - BAILER  
 PP - PERISTALTIC PUMP  
 SL - SUCTION LIFT PUMP

SP - SUBMERSIBLE PUMP  
 AL - AIR-LIFT SAMPLER  
 BP - BLADDER PUMP



# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Qalena LOG DATE 9-28-92 LOG TIME 1446  
 LOCATION ID 09mw10  
 SAMPLE TYPE N SAMPLE ID 09mw-10-01

INITIAL GROUNDWATER DEPTH (FT) 40.11 to 43.85  
 SAMPLING PERIOD: START 1446 COMPLETE 1530  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-29-92

COMMENTS 110°F Ambient temp.

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.7</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>1335</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-079</u>	
TEMPERATURE	TEMP	°C	<u>2.5</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>1050</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1415	0.0	--	--	--	START PUMPING
1437	2	7.2	1594	3.4	
1440	4	6.9	1352	3.1	
1443	6	6.8	1339	2.6	
1446	8	6.7	1335	2.5	-79 mV sampled

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Qalena LOG DATE 9-28-92 LOG TIME 1446  
 LOCATION ID 09mw-11  
 SAMPLE TYPE N SAMPLE ID 09-mw-11-01

INITIAL GROUNDWATER DEPTH (FT) 36.161 to 42.88  
 SAMPLING PERIOD: START 1431 COMPLETE 1700  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-29-92

COMMENTS 116°F Ambient temp

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.3</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/cm	<u>1403</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-138</u>	
TEMPERATURE	TEMP	°C	<u>1.6</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>928</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
<u>15540</u>	<u>0.0</u>	<u>--</u>	<u>--</u>	<u>--</u>	<u>START PUMPING</u>
<u>1608</u>	<u>2</u>	<u>7.3</u>	<u>1120</u>	<u>2.0</u>	
<u>1611</u>	<u>4</u>	<u>6.9</u>	<u>1129</u>	<u>2.1</u>	
<u>1614</u>	<u>6</u>	<u>6.9</u>	<u>1382</u>	<u>1.9</u>	
<u>1620</u>	<u>8</u>	<u>7.0</u>	<u>1410</u>	<u>1.8</u>	
<u>1623</u>	<u>10</u>	<u>6.9</u>	<u>1410</u>	<u>2.4</u>	
<u>1631</u>	<u>13</u>	<u>7.3</u>	<u>1403</u>	<u>1.6</u>	<u>-138 mV Sampled.</u>

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Q0100 LOG DATE 9-30-92 LOG TIME 1449  
 LOCATION ID Q0-mw12  
 SAMPLE TYPE N SAMPLE ID Q0mw12-01

INITIAL GROUNDWATER DEPTH (FT) 15.35 to 21.54  
 SAMPLING PERIOD: START 1449 COMPLETE 1510  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-1-92

COMMENTS Q0m-5.0 BH +1.0 BZ.

FINAL PARAMETER MEASUREMENTS:	COMMENTS
POTENTIAL OF HYDROGEN	pH S.U. <u>6.9</u>
SPECIFIC CONDUCTANCE	SC $\mu$ mhos/c <u>569</u>
REDOX POTENTIAL	Eh mvolts <u>-115</u>
TEMPERATURE	TEMP $^{\circ}$ C <u>3.2</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK mg/l <u>904</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1340	0.0	--	--	--	START PUMPING
1352	5	7.2	522	3.0	heavy product odor
1358	10	7.3	593	3.0	
1407	15	7.0	596	2.6	
1422	20	7.0	573	2.7	
1434	25	6.9	557	2.9	
1449	32	6.9	569	3.2	-115mv sampled.

SAMPLES TYPES: (WSACODE)

SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID 09-14-92 LOG DATE 9-14-92 LOG TIME 1540  
 LOCATION ID 09-mw-14  
 SAMPLE TYPE N SAMPLE ID 09-mw-14-01

INITIAL GROUNDWATER DEPTH (FT) 18.91  
 SAMPLING PERIOD: START 1540 COMPLETE 1550  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-15-92

COMMENTS code of burning garbage noticeable  
at site 1510.

FINAL PARAMETER MEASUREMENTS:	COMMENTS
POTENTIAL OF HYDROGEN      pH      S.U. <u>10.10</u>	_____
SPECIFIC CONDUCTANCE      SC $\mu$ mhos/c <u>441</u>	_____
REDOX POTENTIAL      Eh      mvolts <u>47.0</u>	_____
TEMPERATURE      TEMP      °C <u>2.5</u>	_____
ALKALINITY (CaCO <sub>3</sub> )      ALK      mg/l <u>660.0</u>	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP (°C)	COMMENTS
1500	0.0	-	-	-	START PUMPING
1505	5	10.9	439	2.3	
1509	10	10.7	429	2.5	
1515	16	10.7	437	2.5	
1519	20	10.10	437	2.5	
1524	25	10.10	441	2.5	

SAMPLES TYPES: (WSACODE)

SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID galena LOG DATE 10-1-92 LOG TIME 1443  
 LOCATION ID 09mw14  
 SAMPLE TYPE N SAMPLE ID 09-mw-14-01

INITIAL GROUNDWATER DEPTH (FT) 21.54 to 25.20  
 SAMPLING PERIOD: START 1443 COMPLETE  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-2-92

COMMENTS

OVM: BH-0 ; BZ=0

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	_____	_____
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/cm	_____	_____
REDOX POTENTIAL	Eh	mvolts	_____	_____
TEMPERATURE	TEMP	$^{\circ}$ C	_____	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	_____	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1415	0.0	--	--	--	START PUMPING
1419	2				No Functioning PH meter - no Readings. dry well - Allow to recharge.
1421	4				
1426	5				
1443	12		sampled		

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Qalena LOG DATE 9-7-92 LOG TIME 1135  
 LOCATION ID 10-mw-01  
 SAMPLE TYPE N SAMPLE ID 10-mw-01-01

INITIAL GROUNDWATER DEPTH (FT) 15.25 to 40.74  
 SAMPLING PERIOD: START 1230 COMPLETE 1245  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-8-92

COMMENTS

Qum: B2-0, BH-0

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.8</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/cm	<u>703</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-13</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>4.3</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>490</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1135	0.0	--	--	--	START PUMPING
1145	5	6.8	691	4.4	
1150	10	7.0	705	4.5	Black smoke overhead from nearby chimney
1155	15	6.9	720	4.3	"
1200	20	6.8	763	4.3	"
1205	25	6.8	737	4.3	"
1210	30	4.1	737	4.3	boiler furnace off. Recheck pH meter.
1218	37.5	4.9	702	4.3	meter way out of calibration. cant recalibrate.
1222	40	5.0	715	4.3	all pH measurements
1226	45	4.7	703	4.3	after 1205 very questionable.

All other measurements very stable.

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	LB - LAB BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	N - NORMAL	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN		SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Qalena LOG DATE 10-4-92 LOG TIME 1640  
 LOCATION ID 10mw01  
 SAMPLE TYPE N SAMPLE ID 10-mw-01-01  
Resample

INITIAL GROUNDWATER DEPTH (FT) 19.14 td=46.44  
 SAMPLING PERIOD: START 1750 COMPLETE 1810  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-5-92

COMMENTS QUM BH oppm, BZ - oppm - Resample.  
check 7 buffer at site = 7.0

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.5 *</u>
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>597</u>
REDOX POTENTIAL	Eh	mvolts	<u>60</u>
TEMPERATURE	TEMP	$^{\circ}$ C	<u>3.5</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>see original sampling log</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
<u>1640</u>	<u>0.0</u>	<u>--</u>	<u>--</u>	<u>--</u>	<u>START PUMPING</u>
<u>1655</u>	<u>5</u>	<u>6.3</u>	<u>1045</u>	<u>3.4</u>	<u>weather is beautiful</u>
<u>1706</u>	<u>10</u>	<u>6.0</u>	<u>1015</u>	<u>3.4</u>	
<u>1707</u>	<u>15</u>	<u>6.0</u>	<u>1015</u>	<u>3.5</u>	
<u>1720</u>	<u>20</u>	<u>5.9</u>	<u>1007</u>	<u>3.5</u>	
<u>1730</u>	<u>25</u>	<u>6.3</u>	<u>1001</u>	<u>3.4</u>	
<u>1740</u>	<u>30</u>	<u>6.2</u>	<u>599</u>	<u>3.5</u>	
<u>1748</u>	<u>35</u>	<u>6.5</u>	<u>597</u>	<u>3.5</u>	
					<u>*these readings look</u>
					<u>better than the initial</u>

may use in place of 9-7-92 values

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE FB - FIELD BLANK  
 R - REPLICATE TB - TRIP BLANK  
 S - SPIKE LB - LAB BLANK  
 K - KNOWN N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB SP - SUBMERSIBLE PUMP  
 B - BAILER AL - AIR-LIFT SAMPLER  
 PP - PERISTALTIC PUMP BP - BLADDER PUMP  
 SL - SUCTION LIFT PUMP

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 9-7-92 LOG TIME 0950  
 LOCATION ID 10-mw-02  
 SAMPLE TYPE N SAMPLE ID 10-mw-02-01

INITIAL GROUNDWATER DEPTH (FT) 15.71 ~~14.47~~  
 SAMPLING PERIOD: START 1100 COMPLETE 1130  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-8-92

COMMENTS 0.1m = 2.5 BH j 1.0 BZ

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>5.9</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>881</u>	
REDOX POTENTIAL	Eh	mvolts	<u>-99</u>	
TEMPERATURE	TEMP	°C	<u>4.1</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>840</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
0950	0.0	--	--	--	START PUMPING
1005	10	5.8	912	4.2	
1009	15	5.7	906	4.2	
1019	20	5.3	905	4.1	
1025	25	6.3	893	4.2	
1029	30			4.0	
1040	37	6.9	884	4.0	
1042	40	6.2	889	4.1	
1045	42	5.9	881	4.1	

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	



# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID QAL002 LOG DATE 9-7-92 LOG TIME 0950  
 LOCATION ID 10-mw-02  
 SAMPLE TYPE N SAMPLE ID 10-DS-010

INITIAL GROUNDWATER DEPTH (FT) 15.7  
 SAMPLING PERIOD: START 1100 COMPLETE 1130  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-8-92

COMMENTS QUM-2.5 BH; 1.0 BZ  
dup. of 10-mw-02-02

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U. <u>5.9</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c <u>881</u>	
REDOX POTENTIAL	Eh	mvolts <u>-99</u>	
TEMPERATURE	TEMP	$^{\circ}$ C <u>4.1</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l <u>820</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
0950	0.0	--	--	--	START PUMPING
1005	10	5.8	912	4.2	
1009	15	5.7	906	4.2	
1019	20	5.3	905	4.1	
1025	25	6.3	893	4.2	
1029	30			4.0	
1040	37	6.9	884	4.0	
1042	40	6.2	889	4.1	
1045	42	5.9	881	4.1	

## SAMPLES TYPES: (WSACODE)

D -	DUPLICATE	FB -	FIELD BLANK
R -	REPLICATE	TB -	TRIP BLANK
S -	SPIKE	LB -	LAB BLANK
K -	KNOWN	N -	NORMAL

## SAMPLE METHODS: (WSMCODE)

G -	GRAB	SP -	SUBMERSIBLE PUMP
B -	BAILER	AL -	AIR-LIFT SAMPLER
PP -	PERISTALTIC PUMP	BP -	BLADDER PUMP
SL -	SUCTION LIFT PUMP		

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 9-7-92 LOG TIME 1530  
 LOCATION ID 10mw03  
 SAMPLE TYPE N SAMPLE ID 10mw03-02

INITIAL GROUNDWATER DEPTH (FT) 110.22 rd 47.87  
 SAMPLING PERIOD: START 1520 COMPLETE 1530  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-8-92

COMMENTS Over 110S, Blt -1.5

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>7.0</u>
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>627</u>
REDOX POTENTIAL	Eh	mvolts	<u>019</u>
TEMPERATURE	TEMP	°C	<u>4.1</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>590</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1400	0.0	--	--	--	START PUMPING
1412	5	-	720	4.5	
1416	10	6.6	585	3.6	
1425	15	6.9	589	3.5	
1436	20	6.7	599	3.5	
1443	25	6.9	587	3.1	
1450	30	6.9	584	3.2	
1455	36	6.9	579	3.1	
1520	37	7.0	627	4.1	Sampled
1530					finish sampling.

## SAMPLES TYPES: (WSACODE)

D -	DUPLICATE	FB -	FIELD BLANK
R -	REPLICATE	TB -	TRIP BLANK
S -	SPIKE	LB -	LAB BLANK
K -	KNOWN	N -	NORMAL

## SAMPLE METHODS: (WSMCODE)

G -	GRAB	SP -	SUBMERSIBLE PUMP
B -	BAILER	AL -	AIR-LIFT SAMPLER
PP -	PERISTALTIC PUMP	BP -	BLADDER PUMP
SL -	SUCTION LIFT PUMP		

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID galena LOG DATE 10-7-92 LOG TIME 1535  
 LOCATION ID 11mw01  
 SAMPLE TYPE N SAMPLE ID 11mw01-01

INITIAL GROUNDWATER DEPTH (FT) 16.10 to 18.44  
 SAMPLING PERIOD: START 1615 COMPLETE 1635  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 10-8-92

COMMENTS 0.0m BH - 0.0ppm. BZ - 0.0ppm.  
Rain - soft bottom.

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.1</u>	
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>655</u>	
REDOX POTENTIAL	Eh	mvolts	<u>184</u>	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>34</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>660</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
1535	0.0	--	--	--	START PUMPING
1540	1	5.7	851	4.7	
1545	2	6.2	761	4.0	
1555	3	6.0	703	3.5	
1600	4	6.2	673	3.5	
1605	5	6.0	668	3.5	
1610	6	6.1	655	3.4	Sample.

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Galena LOG DATE 9-27-92 LOG TIME 1615  
 LOCATION ID 11-mw02  
 SAMPLE TYPE N SAMPLE ID 11-mw-02-01

INITIAL GROUNDWATER DEPTH (FT) 10.94 to 21.30  
 SAMPLING PERIOD: START 1115 COMPLETE 1625  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9-28-92

COMMENTS 20°F Ambient temp.

## FINAL PARAMETER MEASUREMENTS:

## COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.7</u>	
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>1507</u>	
REDOX POTENTIAL	Eh	mvolts		
TEMPERATURE	TEMP	°C	<u>4.7</u>	
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>740</u>	

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1545	0.0	--	--	--	START PUMPING
1559	2	6.8	1461	4.5	
1603	4	6.7	1501	4.7	
1607	6	6.7	1503	4.7	
1611	8	6.7	1509	4.6	
1615	11	6.7	1507	4.7	

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Qalena LOG DATE 9/23/92 LOG TIME 11025  
 LOCATION ID 12mw-01  
 SAMPLE TYPE N SAMPLE ID 12-mw-01-01

INITIAL GROUNDWATER DEPTH (FT) 15.88 to 28.93  
 SAMPLING PERIOD: START 1645 COMPLETE  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9/24/92

COMMENTS

## FINAL PARAMETER MEASUREMENTS:

			COMMENTS
POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.8</u>
SPECIFIC CONDUCTANCE	SC	$\mu$ mhos/c	<u>975</u>
REDOX POTENTIAL	Eh	mvolts	
TEMPERATURE	TEMP	$^{\circ}$ C	<u>2.3</u>
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>492</u>

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC ( $\mu$ MHOS/CM)	TEMP ( $^{\circ}$ C)	COMMENTS
11025	0.0	--	--	--	START PUMPING
11027	3	7.5	929	1.8	
11033	5	6.9	863	1.4	
11035	7	6.8	940	1.9	
11037	9	6.7	973	2.3	
11038	11	6.8	980	2.3	
11040	15	6.8	975	2.3	
11045					Sampled

## SAMPLES TYPES: (WSACODE)

D - DUPLICATE	FB - FIELD BLANK
R - REPLICATE	TB - TRIP BLANK
S - SPIKE	LB - LAB BLANK
K - KNOWN	N - NORMAL

## SAMPLE METHODS: (WSMCODE)

G - GRAB	SP - SUBMERSIBLE PUMP
B - BAILER	AL - AIR-LIFT SAMPLER
PP - PERISTALTIC PUMP	BP - BLADDER PUMP
SL - SUCTION LIFT PUMP	

# GROUND WATER QUALITY SAMPLING RECORD

PAGE 1

INSTALLATION ID Qalera LOG DATE 9/23/92 LOG TIME 1520  
 LOCATION ID 12-mw-02  
 SAMPLE TYPE N SAMPLE ID 12mw0201

INITIAL GROUNDWATER DEPTH (FT) 13.89 to 21.13  
 SAMPLING PERIOD: START 1520 COMPLETE 1545  
 SAMPLING METHOD B LOGGER CODE RAD  
 LAB CODE RAS DATE SENT 9/24/92

COMMENTS \_\_\_\_\_

## FINAL PARAMETER MEASUREMENTS:

COMMENTS

POTENTIAL OF HYDROGEN	pH	S.U.	<u>6.7</u>	_____
SPECIFIC CONDUCTANCE	SC	μmhos/c	<u>971</u>	_____
REDOX POTENTIAL	Eh	mvolts	_____	_____
TEMPERATURE	TEMP	°C	<u>3.9</u>	_____
ALKALINITY (CaCO <sub>3</sub> )	ALK	mg/l	<u>504</u>	_____

TIME	TOTAL VOLUME WITHDRAWN (GALLONS)	PH	SC (μMHOS/CM)	TEMP (°C)	COMMENTS
1520	0.0	--	--	--	START PUMPING
1525	2	6.6	924	3.6	
1530	6	6.6	957	3.9	
1534	10	6.5	970	3.9	
1537	12	6.6	970	3.5	
1540	14	6.7	971	3.9	
1545					sampled.

## SAMPLES TYPES: (WSACODE)

## SAMPLE METHODS: (WSMCODE)

D - DUPLICATE	FB - FIELD BLANK	G - GRAB	SP - SUBMERSIBLE PUMP
R - REPLICATE	TB - TRIP BLANK	B - BAILER	AL - AIR-LIFT SAMPLER
S - SPIKE	LB - LAB BLANK	PP - PERISTALTIC PUMP	BP - BLADDER PUMP
K - KNOWN	N - NORMAL	SL - SUCTION LIFT PUMP	

**1993 Groundwater Sampling Forms**

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 01-MW-01  
Date: 6/13/93  
Time: 1155

Location: 01 (FTA)  
Weather: Sunny and fairly warm, light breeze  
Samplers: RIC and LCO

Comments: Well <sup>cap</sup> 1 was open because the transducer was in the well.  $\therefore$  No build up of any organic vapors. No noticeable odor, though. Transducer pulled at 1100. Meter check - Turbidimeter needed recalibration.

**HNU/OVA Reading (ppm):**

Water Depth (ft. btoc):

**Product Thickness (ft.):**

Well Volume (gal.):

$$\emptyset^* (B_{L_1} = \emptyset)$$

7.38

1

15.9

**Product Depth (ft. btoc):**

Well Depth (ft. btoc):

**Saturated Thickness (ft.):**

3 well volumes (gal.):

**Purge Method:**

Water

**Sample Method:**

## Water

[illegible]

E-251

Alkalinity = 656 mg/L  $\text{CaCO}_3$



## GROUNDWATER SAMPLING LOG

Project: Galena AFS RI  
Client: AFCEE

Well ID: 01-MW-02  
Date: 6/13/93  
Time: 0945

Location: 01 (FTA)  
Weather: Sunny and cool, warming up  
Samplers: BKC and LCO.

Comments: Meter check: pH 7 = 7.05 OK  
10 NTU = 9.99 ✓  
0.5 NTU = 0.51 ✓

## Field Measurements

HNU/OVA Reading (ppm): 0 (B.G. = 0)  
Water Depth (ft. btoc): 7.45  
Product Thickness (ft.): —  
Well Volume (gal.): 8.3

Product Depth (ft. btoc): —  
Well Depth (ft. btoc): 29.64  
Saturated Thickness (ft.): 22.19  
3 well volumes (gal.): ~~25.9~~ 24.9

Purge Method: Waterra

Sample Method: Waterra

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
0910	0	—	—	—	—	Begin purge
0919	5	2	6.65	1160	1692	Very unstable turbidity.
0922	10	1	6.53	1200	—	very cold water!
0925	15	1	6.50	1190	188	turbidity difficult to
0930	20	1.5	6.53	1190	150	measure → lots of
0937	25	1.5	6.54	1200	*176	sand in water which
						settles out rapidly with
						time shifting out bottom
						of cuvette. In allowing
						sand particles to settle
						then decanting and
						measuring suspended
						material.
						* This last reading
						was taken without
						decanting - it looked
						fairly stable.
0937	25	1.5	6.54	1200	176	Final Measurements

\*176

Alkalinity = 686 mg/L  $\text{CaCO}_3$

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 02-GW-01  
Date: 6/5/93  
Time: 1620

Base Supply  
Location: Well #1  
Weather: partly cloudy, cool  
Samplers: BJC/KCO

Comments: Meter checks - see 06-MW-04 resample log.

HNU/OVA Reading (ppm): \_\_\_\_\_  
 Water Depth (ft. btoc): \_\_\_\_\_  
 Product Thickness (ft.): \_\_\_\_\_  
 Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): \_\_\_\_\_  
Saturated Thickness (ft.): \_\_\_\_\_  
3 well volumes (gal.): \_\_\_\_\_

Purge Method:                     

Sample Method: Sp. pot

[illegible]



**Project:** Galena AFS RI  
**Client:** AFCEE

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: ~~02~~<sup>5</sup>-02-GW-03  
Date: 6/17/93  
Time: 1400

Location: Base Supply Well #7  
Weather: Cloudy, Cool, Sprinkles  
Samplers: LCO BJE

Comments: 02-GW<sup>03</sup> DS-03 is a duplicate sample from this location

HNU/OVA Reading (ppm):	—
Water Depth (ft. btoc):	—
Product Thickness (ft.):	—
Well Volume (gal.):	—

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): \_\_\_\_\_  
Saturated Thickness (ft.): \_\_\_\_\_  
3 well volumes (gal.): \_\_\_\_\_

Purge Method: SD 190T

Sample Method: S/SOT

[illegible]

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 03-GW-020  
Date: 6/17/93  
Time: 1445

Location: Danny Patrick's well  
Weather: Partly cloudy, warm  
Samplers: JRC

Comments: 03-GW-02-DS-03 is a duplicate sample from this location

HNU/OVA Reading (ppm): \_\_\_\_\_

Water Depth (ft. btoc): \_\_\_\_\_

Product Thickness (ft.): \_\_\_\_\_

Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): -  
Well Depth (ft. btoc): 54 ft.  
Saturated Thickness (ft.): -  
3 well volumes (gal.): -

Purge Method: spigot

Sample Method: spigot

## Final Measurements

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 03-GW-03  
Date: 6/17/93  
Time: 1435

Location: Norman Burgett's and Roland Chadbourne's  
Weather: partly cloudy; warm well  
Samplers: BP

~~03-610-05-05-03 is a duplicate sample for BJR~~

HNU/OVA Reading (ppm): \_\_\_\_\_  
 Water Depth (ft. btoc): \_\_\_\_\_  
 Product Thickness (ft.): \_\_\_\_\_  
 Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): \_\_\_\_\_  
Saturated Thickness (ft.): \_\_\_\_\_  
3 well volumes (gal.): \_\_\_\_\_

Spizot

spigot

## Final Measurements

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 03-QW-04  
Date: 6/17/93  
Time: 1420

Location: Hobo's Yukon Inn well  
Weather: partly cloudy,  
Samplers: JTC

### Field Measurements

HNU/OVA Reading (ppm): \_\_\_\_\_

Water Depth (ft. btoc): \_\_\_\_\_

Product Thickness (ft.): \_\_\_\_\_

Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): \_\_\_\_\_  
Saturated Thickness (ft.): \_\_\_\_\_  
3 well volumes (gal.): \_\_\_\_\_

Purge Method: spigot

Sample Method: sp. 50t

E-258

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 04-MW-02  
Date: 6/6/93  
Time: 18:45

Location: 04  
Weather: Partly cloudy and warm  
Samplers: BUC / LCI

### Field Measurements

HNU/OVA Reading (ppm):	0 (BG) = 0
Water Depth (ft. btoc):	9.17
Product Thickness (ft.):	—
Well Volume (gal.):	3.3

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 18.02  
Saturated Thickness (ft.): 9.85  
3 well volumes (gal.): 10

Purge Method: Water

Sample Method: Water

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
1600	0	10	6.43	1070	-	Begin purge
1605	2	7	6.42	1060		turbidity meter not calibrating
1611	5	5	6.43	970		
1617	7	5	6.60	960	57	Road traffic - 40 ft
1620	8	4	6.48	1060		
1625	10	4	6.56	1060		
1630	11	4	6.5	1060	66	Final Measurements

$$\Delta K_{\text{colinity}} = 570$$





**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 05-MW-01  
Date: 6/16/93  
Time: 1340

Location: 05 (POL)  
Weather: Warm and Sunny  
Samplers: BJC and LCO

Comments: Meter check = pH 7.0 = 7.03 - OK  
Turbidity meter needed slight recalibration.  
Odor of creosote @ site.

HNU/OVA Reading (ppm): 8 (B.C. = 0)  
 Water Depth (ft. btoc): 12.77  
 Product Thickness (ft.): -  
 Well Volume (gal.): 15.5

Product Depth (ft. btoc):             
Well Depth (ft. btoc): 54.11  
Saturated Thickness (ft.): 41.34  
3 well volumes (gal.): 46.5

Sample Method: *Water*

[illegible]
$$\text{Alkalinity} = 728 \text{ mg/L CaCO}_3$$

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: EE 05-MW-02  
Date: 6/16/93  
Time: 1040

Location: 05 (POL)  
Weather: warm and sunny  
Samplers: BJC/LCO

Comments: Meter Check: pH 7.0 = 7.03 OK.  
9.6 NTU = 9.9, set to 9.6  
485 NTU = 49, OK.

HNU/OVA Reading (ppm): 0 (B.G. = 0)  
 Water Depth (ft. btoc): 1156  
 Product Thickness (ft.): —  
 Well Volume (gal.): 15.7

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 53.31  
Saturated Thickness (ft.): 41.75  
3 well volumes (gal.): 47.1

Purge Method: Water

Sample Method: Water

[illegible]
$$\text{Alkalinity} = 410 \text{ mg/L CaCO}_3$$

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 05-MW-03  
Date: 6/17/93  
Time: 1910

Location: 05 (POL)  
Weather: raining, cool  
Samplers: BJC and LCO

Comments: No free product in well. (Used new Keck interface probe)  
 \* OVM reading was only 6 on 6/11/93 when hydrocarbon. Suspect?  
 survey was done. Meter check: pit 7.0 = 7.00 - OK  
 9.6 NTU = 9.6, 0.985 NTU - slight adjustment.

HNU/OVA Reading (ppm): 656 (B.G. = 0)  
 Water Depth (ft. btoc): 9.92  
 Product Thickness (ft.): \_\_\_\_\_  
 Well Volume (gal.): 16.4

Product Depth (ft. btoc):	—
Well Depth (ft. btoc):	53.69
Saturated Thickness (ft.):	43.77
3 well volumes (gal.):	49.2

Purge Method: Water

Sample Method: Water

[illegible]
$$\text{Alkalinity} = 628 \text{ mg/L CaCO}_3$$

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 05-MW-03-DS  
Date: 6/17/93  
Time: 1910

Location: 05 (POL)  
Weather: Cloudy / cool  
Samplers: BX / LCO

Comments: see log for 05-MW-03

HNU/OVA Reading (ppm): \_\_\_\_\_  
 Water Depth (ft. btoc): \_\_\_\_\_  
 Product Thickness (ft.): \_\_\_\_\_  
 Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): \_\_\_\_\_  
Saturated Thickness (ft.): \_\_\_\_\_  
3 well volumes (gal.): \_\_\_\_\_

Purge Method: Water

Sample Method: Water

[illegible]

Alkalinity = 642 mg/L  $\text{CaCO}_3$

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 05-MW-04  
Date: 6/16/93  
Time: 1600

Location: 05 (POL)  
Weather: warm and sunny, breezy  
Samplers: BJC / LCO

Comments: Did not attempt to measure product -- probe isn't working. We will measure it with new probe during hydrocarbon survey.

Meter check 9.6 NTU = 9.66 - OK, 0.85 NTU needs slight adjustment.

Field Measurements PH 7.0 = 7.03, o/c.

HNU/OVA Reading (ppm):	420 (B.G. = 0)
Water Depth (ft. btoc):	87.0
Product Thickness (ft.):	~1
Well Volume (gal.):	15.2

Product Depth (ft. btoc):             
Well Depth (ft. btoc): 49.18  
Saturated Thickness (ft.): 40.48  
3 well volumes (gal.): 45.6

Purge Method: Water

Sample Method: Waterwa

[illegible]
$$\text{Alkalinity} = 840 \text{ mg/L } \text{CaCO}_3$$

E-265

\* after beginning to purge, B.Z. went up to 62. Respirators donned.

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 05-MW-05  
Date: 6-17-93  
Time: 1130

Location: off (PUL)  
Weather: Cloudy, Cool  
Samplers: 1CO / BJR

Comments: No working interface probe. We will measure product (if any) when the new probe arrives. #Meter checks: pH 7.0 = 7.00 → OK!  
Turbidity meter needed slight tweaking.

Field Measurements

HNU/OVA Reading (ppm): 263  
 Water Depth (ft. btoc): 7.49  
 Product Thickness (ft.): X -  
 Well Volume (gal.): 16.5

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 51.59  
Saturated Thickness (ft.): 44.1  
3 well volumes (gal.): 49.5

Purge Method: Waterra

Sample Method: *Water run*

[illegible]
$$\text{Alkalinity} = 644 \text{ mg/L } \text{CaCO}_3$$

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 05-MW-06  
Date: 6/16/93  
Time: 1845

Location: 05 (POL)  
Weather: warm and sunny, breezy  
Samplers: BJC and LCO

Comments: \* OVM lamp out. We will look at it tonight. This well had an OVM reading of 0 during the hydrocarbon survey on 6/11/93  
Meter check: pH 7.0 = 6.96 - OK

HNU/OVA Reading (ppm): \* -  
 Water Depth (ft. btoc): 0.65  
 Product Thickness (ft.): -  
 Well Volume (gal.): 16.1

Product Depth (ft. btoc):           —            
Well Depth (ft. btoc):           49.51            
Saturated Thickness (ft.):           42.86            
3 well volumes (gal.):           48.3          

Purge Method: Water

Sample Method: Water

[illegible]

Alkalinity = 400 mg/L  $\text{CaCO}_3$   
E-267



**GROUNDWATER SAMPLING LOG**

Project: Galena AFS RI  
Client: AFCEE

Well ID: 06-MW-01  
Date: 6/10/93  
Time: 1205

Location: 06 (West unit - waste accumulation area)  
Weather: Warm and Sunny  
Samplers: BDC and LCO

Comments: OVM is acting strange. The well appears to have detectable O.V., but and background and B2 are mostly 0. However, twice the OVM went up to over 2000 and the alarm came on. There is no odor, though. The OVM did this two days ago and was found to be out of calibration. Will recalibrate.

HNU/OVA Reading (ppm): 150.6 (BQ = 0)  
Water Depth (ft. btoc): ~~52.73~~ 14.00  
Product Thickness (ft.): —  
Well Volume (gal.): 14.5

Product Depth (ft. btoc): —  
Well Depth (ft. btoc): 52.73  
Saturated Thickness (ft.): 38.73  
3 well volumes (gal.): 43.5

Purge Method: Waterwa

Sample Method: Waterwa

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
1130	5	7	6.63	1380	—	
1133	10	—	—	—	—	too turbid to get a
1136	15	6	6.75	1390	—	reading.
1145	20	6	6.77	1380	—	
1149	25	6	6.75	1380	—	
1151	30	6	6.74	1380	—	
1153	35	6	6.75	1380	—	
1148	40	6	6.75	1380	—	
1200	44	6	6.76	1380	—	
1200	44	6	6.76	1380	—*	Final Measurements

Alkalinity = 830 mg/L CaCO<sub>3</sub>

\* Took a turbidity meter following sampling and got a reading of 175 (200 is max. readable level).

**Project:** Galena AFS RI  
**Client:** AFCEE

Comments: This well is being resampled due to the late <sup>and warm</sup> arrival of coolers 6-11-A and 6-11-B. Meter check: pH 7.0 = 6.95 OK

**HNU/OVA Reading (ppm):**

**Product Thickness (ft.):**

Well Volume (gal.):

**Purge Method:**

Waterra

**Product Depth (ft. btoc):**

Well Depth (ft. btoc):

**Saturated Thickness (ft.):**

3 well volumes (gal.):

**Sample Method:**

Kvaternar

[illegible]

\* ORM reading is mostly 0, but bouncing up every once in a while to 40, 50, 60. Not sure if this is real. It looks like 0.

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 06-MW-02  
Date: 6/10/93  
Time: 1545

Location: 06 (West unit - waste accumulation area)  
Weather: storm approaching, but sunny and clear  
Samplers: LCO/BJC

**Comments:**

### Field Measurements

HNU/OVA Reading (ppm): 0 (B.G. = 0)  
 Water Depth (ft. btoc): 10.43  
 Product Thickness (ft.): -  
 Well Volume (gal.): 155

Product Depth (ft. btoc):           —            
Well Depth (ft. btoc): 51.83  
Saturated Thickness (ft.): 41.40  
3 well volumes (gal.): 46.5

Purge Method: *Water*

Sample Method: Watering

[illegible]

Alkalinity = 764 mg/L  $\text{CaCO}_3$













**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 07-MW-02  
Date: 6/9/93  
Time: 1500

Location: OT (Campion)  
Weather: Warm and sunny, breezy, MO  
Samplers: BJC and LCO

Comments: All OVM readings are 0, but it smells like hydrocarbons, and there is a sheen on the groundwater. Meter calibrations were a little off. Recalibrated both meters.

HNU/OVA Reading (ppm): 0 (B.C. = 0 ?)

Water Depth (ft. btoc): 2.90

Product Thickness (ft.): ~

Well Volume (gal.): 7.2

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 22.21  
Saturated Thickness (ft.): 19.31  
3 well volumes (gal.): 21.6

Purge Method: Water

Sample Method: *Water*

[illegible]

Alkalinity = 730 mg per liter  $\text{CaCO}_3$



**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 07-mw-03  
Date: 8-10-93  
Time: 1800

Location: Campion  
Weather: Warm and Sunny  
Samplers: BSC / CMS

**Comments:**

Sample id = 07-mw-03-03  
\*from last years measurement - casing now broken

### Field Measurements

HNU/OVA Reading (ppm):	0 ppm
Water Depth (ft. btoc):	4.33
Product Thickness (ft.):	
Well Volume (gal.):	14.4

Product Depth (ft. btoc):  
Well Depth (ft. btoc): 17.06\*  
Saturated Thickness (ft.): 12.73  
3 well volumes (gal.):

**Purge Method:**

water

Sample Method: Water

[illegible]

Alkalinity = 790 mg/L CaCO<sub>3</sub>

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 07-MW-04  
Date: 7-29-93  
Time: 1050

Location: Campion  
Weather: pt. cloudy, cool, 58°  
Samplers: LCO

Comments: Sample ID = 07-MW-04-03

HNU/OVA Reading (ppm): \_\_\_\_\_  
 Water Depth (ft. btoc): \_\_\_\_\_  
 Product Thickness (ft.): \_\_\_\_\_  
 Well Volume (gal.): \_\_\_\_\_

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): \_\_\_\_\_  
Saturated Thickness (ft.): \_\_\_\_\_  
3 well volumes (gal.): 50

Purge Method: Water

Sample Method: *Watera*

E-279



**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 09-MW-02  
Date: 6/13/93  
Time: 1450

Location: 09 (West Unit - Million Gallon Hill)  
Weather: Warm and sunny  
Samplers: BJK and LCO

Comments: pH meter checks --  $7.0 = 6.95$  OK  
Turbidimeter --  $10 = 10.14$ ,  $0.5 = 0.59$

HNU/OVA Reading (ppm): 0 (B.C. = 0)  
 Water Depth (ft. btoc): 2.23  
 Product Thickness (ft.): —  
 Well Volume (gal.): 16.0

Product Depth (ft. btoc):             
Well Depth (ft. btoc): 44.92  
Saturated Thickness (ft.): 42.69  
3 well volumes (gal.): 48.0

Purge Method: Water

Sample Method: Waterra

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
1422	0	-	-	-	-	<i>Begin purge</i>
1424	5	6	6.66	1130	184	
1429	15	5	6.76	1100	118	
1434	20	4.5	6.80	1080	67	
1437	25	4.5	6.79	1060	63	
1440	30	4.5	6.79	1070	68	
1443	35	4.5	6.79	1060	45	
1445	40	4.5	6.80	1060	40	
1447	45	4.0	6.79	1050	38	
1449	48	4.5	6.81	1060	16	
1449	48	4.5	6.81	1060	16	Final Measurements

Alkalinity = 600 mg/L  $\text{CaCO}_3$

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 09-MW-03  
Date: 6/14/93  
Time: 1405

Location: 09 (West unit - Million Gallon Hill)  
Weather: warm and sunny  
Samplers: BJC/LCO

Comments: pH meter check: pH 7.0 = 7.03  
turbidity meter: need slight recalibration.

HNU/OVA Reading (ppm): 0 (B.G. = 0)  
 Water Depth (ft. btoc): 563  
 Product Thickness (ft.): 3  
 Well Volume (gal.): 15.6

Product Depth (ft. btoc):	—
Well Depth (ft. btoc):	47.33
Saturated Thickness (ft.):	41.70
3 well volumes (gal.):	46.8

Purge Method: Naferra

Sample Method: Watermark

[illegible]
$$\text{Alkalinity} = 454 \text{ mg/L CaCO}_3$$





**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 09-MW-05  
Date: 6/14/93  
Time: 1745

Location: 09 West limit - Million Gallon Hill  
Weather: Hot and sunny  
Samplers: BJG/LCO

Comments: Meter check - pH 7.0 = 7.02  
- turbidity meter is not calibrating well at all. keeps drifting up

HNU/OVA Reading (ppm): 5.1 (K<sub>OG</sub> = 12)

Water Depth (ft. btoc): 3.26

Product Thickness (ft.): —

Well Volume (gal.): 16.4

Product Depth (ft. btoc):	—
Well Depth (ft. btoc):	47.05
Saturated Thickness (ft.):	43.79
3 well volumes (gal.):	49.2

Purge Method: W/air term.

Sample Method: Water

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
1720	0	-	-	-	-	Begin purge
1724	10	5	6.45	990	-	
1728	20	3.5	6.72	990	75	
1733	30	3.5	6.74	990	-	
1735	35	3.5	6.74	990	37	
1738	40	3.0	6.75	990	35	
1740	45	3.0	6.75	980	30	
					</	

Alkalinity = 464 mg/L  $\text{CaCO}_3$



**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 1C-MW-01  
Date: 6-8-93  
Time: 1535

Location: 10  
Weather: cool and cloudy  
Samplers: BCF LCO

Comments: Removed transducers @ 2:20  
Checked pH meter 7.0 = 7.01. Turbidity meter 10 = 10.33  
Field Measurements 15 = .6

HNU/OVA Reading (ppm): 0 (BCL = 0)  
 Water Depth (ft. btoc): 721  
 Product Thickness (ft.): —  
 Well Volume (gal.): 14.8

Product Depth (ft. btoc): \_\_\_\_\_  
Well Depth (ft. btoc): 46.63  
Saturated Thickness (ft.): 39.42  
3 well volumes (gal.): 44.4

Purge Method: Water

Sample Method: Water ra

Alkalinity = 630 mg/L  $\text{CaCO}_3$

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 10-MW-01  
Date: 6/15/93  
Time: 1855

Location: 10 Vehicle Maintenance Building  
Weather: warm; partly cloudy  
Samplers: BK 11c0

Comments: Asked to resample well to collect enough water for Nitrate/Nitrite, Anions, and TDS. Meter check: 9.6 NTU = 9.45 (set to 1185 NTU = 117 (set to 11

HNU/OVA Reading (ppm):	0 (B.G. = 0)
Water Depth (ft. btoc):	6.37
Product Thickness (ft.):	-
Well Volume (gal.):	15.1

Product Depth (ft. btoc):                       
Well Depth (ft. btoc): 46.63 (measured 6-8-93)  
Saturated Thickness (ft.): 40.26  
3 well volumes (gal.): 45.3

Purge Method: Water

Sample Method: Waterwa

Time	Cum. Vol. (gal.)	Water		Quality		Comments
		Temp.	pH	Cond	Turbidity	
1831	0	—	—	—	—	Begin purge
1840	20	6	6.50	1060	<sup>104</sup> <del>205</del>	s/c Had turbidimeter set on wrong range
1844	30	4.5	6.58	1130	83	
1850	40	4.5	6.62	1140	55	
		4.5	6.63			
		</				

## GROUNDWATER SAMPLING LOG

Project: Galena AFS RI  
Client: AFCEE

Well ID: 10-NW-02  
Date: 6/8/93  
Time: 19

Location: 10  
Weather: partly cloudy, cool, breezy  
Samplers: BJC/LCO

Comments: Used interface probe, but could not detect free product. OVM reading very high, but background and breathing zone = 0. Check turbidity meter: 10 = 10.08, 0.5 = 0.59  
Field Measurements Check pH meter: \*7 = 7.01

HNU/OVA Reading (ppm): 234 (B.G. = 0)  
Water Depth (ft. btoc): 7.34  
Product Thickness (ft.): -  
Well Volume (gal.): 15.1

Product Depth (ft. btoc): -  
Well Depth (ft. btoc): 47.57  
Saturated Thickness (ft.): 40.23  
3 well volumes (gal.): 45.3

Purge Method: Waterra

Sample Method: Waterra

Time	Cum. Vol. (gal.)	Water Quality				Comments
		Temp.	pH	Cond	Turbidity	
16:40	0	-	-	-	-	Begin purge
16:45	5	5	6.69	1330	11.2	
16:54	15	4	6.79	1320	7.6	
17:00	20	4	6.82	1330	8.3	
17:04	25	4	6.83	1320	7.0	
17:06	30	4	6.84	1320	9.?	really unstable turb.
17:08	35	4	6.82	1320	-	stentis
17:10	40	4	6.83	1330	8.?	still fluctuating alot,
17:14	45	4	6.83	1320		but within a small range (7-9-9)
17:14	45	4	6.83	1320	8	Final Measurements

Alkalinity = 780 mg/L CaCO<sub>3</sub>

E-288

\* Thin film noticeable in purge stream



**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 12-MW-01  
Date: 6/6/93  
Time: 1930

Location: 12  
Weather: Raining  
Samplers: LCO/BIC

### Field Measurements

HNU/OVA Reading (ppm): 0 (BG = 0)  
 Water Depth (ft. btoc): 3.78  
 Product Thickness (ft.): —  
 Well Volume (gal.): 9.5

Product Depth (ft. btoc): —  
Well Depth (ft. btoc): 29.02  
Saturated Thickness (ft.): 25.24  
3 well volumes (gal.): 28.5

Purge Method: Water

Sample Method: Waiver

Start 6:45

E-290

& pH Calibration suddenly way out.  $7 = 3.62$ . In water  
 in battery case?!?

Alkalinity = 540

**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 12MW-02  
Date: 6-7-93  
Time: 13:50

Location: 12  
Weather: Warm and sunny, breezy to gusty  
Samplers: LCO / RJC

**Comments:**

## Field Measurements

HNU/OVA Reading (ppm): 0 (BG = 0)  
 Water Depth (ft. btoc): 1.83  
 Product Thickness (ft.): -  
 Well Volume (gal.): 8.9

Product Depth (ft. btoc):             
Well Depth (ft. btoc): 25.66  
Saturated Thickness (ft.): 23.83  
3 well volumes (gal.): 26.7

Purge Method: Water

Sample Method: Watermark

[illegible]

Alkalinity = 490 mg/L  $\text{CaCO}_3$



**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 12-MW-02-DS-03  
Date: 6-7-93  
Time: 13:50

Location: 12  
Weather: warm and sunny, windy  
Samplers: BJC/LCO

### **Field Measurements**

HNU/OVA Reading (ppm): 0

Water Depth (ft. btoc): ~~3.84~~ 1.83

Product Thickness (ft.): -

Well Volume (gal.): ~~50~~ 8.9

Product Depth (ft. btoc):	
Well Depth (ft. btoc):	<del>41</del> 25.66
Saturated Thickness (ft.):	<del>39.82</del> 23.83
3 well volumes (gal.):	<del>45</del> 26.7

Purge Method: Water

Sample Method: Water

[illegible]

Alkalinity = 500 mg/L  $\text{CaCO}_3$













**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 06 MW 07  
Date: 9-13-93  
Time: 1400

Location: BL  
Weather: cool & cloudy  
Samplers: BJC / MAR

Comments: pH needed slight recalibration.

HNU/OVA Reading (ppm): \_\_\_\_\_  
 Water Depth (ft. btoc): 22.60  
 Product Thickness (ft.): —  
 Well Volume (gal.): 3.3

Product Depth (ft. btoc):	
Well Depth (ft. btoc):	42.74
Saturated Thickness (ft.):	20.14
3 well volumes (gal.):	10

Purge Method: *water*

Sample Method: water

[illegible]
$$\text{alkalinity} = 824 \text{ mg/L CaCO}_3$$







**Project:** Galena AFS RI  
**Client:** AFCEE

Well ID: 10-MW-04  
Date: 9/12/93  
Time: 1620

Location: 10 (VMB)  
Weather: Cloudy & Cool  
Samplers: BJC / MAK

### **Field Measurements**

HNU/OVA Reading (ppm): \_\_\_\_\_

Water Depth (ft. btoc): 12.38 ft

Product Thickness (ft.):         

Well Volume (gal.): 3.7

Product Depth (ft. btoc):             
Well Depth (ft. btoc): 35.13  
Saturated Thickness (ft.): 22.25  
3 well volumes (gal.): 11

Purge Method: Watkita

Sample Method: Water

[illegible]
$$\text{alkalinity} = 660 \text{ mg/L CaCO}_3$$

**1994 Groundwater Sampling Forms**







## GROUNDWATER QUALITY SAMPLING LOG

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 01-MW-06  
Date: 9-16-94  
Time: 1335

Location: FTAP  
Weather: Cloudy 40°F  
Samplers: SLH, MAR

Comments: No 8270

### Field Measurements:

OVM Reading (ppm):	_____	Product Depth (ft btoc):	_____
Water Depth (ft btoc):	<u>26.79</u> <sup>OW</sup> <u>16.79</u>	Well Depth (ft btoc):	<u>26.79</u>
Product Thickness (ft):	_____	Saturated Thickness (ft):	<u>10.00</u>
Borehole Volume (gal):	<u>9.00</u>	3 Borehole Volumes (gal):	<u>24.3</u>

Purge/Sample Method: purge w/ability pump - sample w/water

[illegible]

purged close to dry - let recharge several  
well purged dry minutes

**Final Measurements:**

Temperature 3 pH 6.64 Conductivity 1300 Alkalinity 739 mg/L CaCO<sub>3</sub>







**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 04-MW-02  
Date: 9-16-94  
Time: 1245

Location: E of Runway  
S. of baseball field  
 Weather: Cloudy Rain 36°  
 Samplers: 2 CMR

Comments: Dry Well

OVM Reading (ppm): \_\_\_\_\_  
 Water Depth (ft btoc): 17.30  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 154

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 18.04  
Saturated Thickness (ft): 1.64  
3 Borehole Volumes (gal): 1.3

**Purge/Sample Method:**

[illegible]

Temperature \_\_\_\_\_ pH \_\_\_\_\_ Conductivity \_\_\_\_\_ Alkalinity \_\_\_\_\_









# GROUNDWATER QUALITY SAMPLING LOG

Project: Galena Airport RI/FS  
Client: AFCEE

Well ID: 05-MW-04  
Date: 9-20-74  
Time: 16:35

Location: 500' N of Galena Air Sec.  
Weather: Partly Cloudy, 65°F  
Samplers: 2" dia, 10' max

Comments: Does not appear to be free product -  
ORS not acting quite right though.

## Field Measurements:

OVM Reading (ppm): 24 (high reading)  
Water Depth (ft btoc): 16.83  
Product Thickness (ft):  
Borehole Volume (gal): 29.58

Product Depth (ft btoc):  
Well Depth (ft btoc): 49.81  
Saturated Thickness (ft): 32.98  
3 Borehole Volumes (gal): 88.74

Purge/Sample Method: purge w/ battery pump - sample w/ bailer

Time	Cum. Vol. (gal)	Temp. (deg C)	pH (pH units)	Conductivity (umhos/cm)	Comments:
1704	5	52°F = 5	6.74	1860	brown; murky; white foam (due to pump difficulty)
1720	20	41°F = 5	6.79	1770	
1725	35	41.5°F = 5	6.78	1710	
1731	50	41°F = 5	6.77	1730	
1737	65	41°F = 5	6.77	1740	
1744	80	41°F = 5	6.77	1760	still a little foamy; maybe it's not the pump
1749	90	41°F = 5	6.78	1790	

## Final Measurements:

Temperature 5 pH 6.78 Conductivity 1790 Alkalinity 970



# GROUNDWATER QUALITY SAMPLING LOG

Project: Galena Airport RI/FS  
Client: AFCEE

Well ID: 05-mw-05  
Date: 9-20-94  
Time: 1305

Location: N of Runway  
Weather: cloudy, 38°F  
Samplers: SL-1/MTR

Comments: \* - added wattera bulb length for OVS movement  
(OVS probe won't go past Wattera bulb)  
OVM reading in drum = 86 ppm - 146 ppm (varies)

## Field Measurements:

OVM Reading (ppm): Cap off of Well  
Water Depth (ft btoc): 16.90  
Product Thickness (ft): 1.06  
Borehole Volume (gal): 31.02 @ 32.41

Top Product 16.84  
Product Depth (ft btoc): 16.90  
Well Depth (ft btoc): ~52.92 Approx  
Saturated Thickness (ft): 36.02  
3 Borehole Volumes (gal): 97.23

Purge/Sample Method: purge w/utility pump - Sample w/wattera

Time	Cum. Vol. (gal)	Temp. (deg C)	pH (pH units)	Conductivity (umhos/cm)	Comments:
1335	5	34°F = 2	6.67	1820	dark gray sediment
1339	20	35°F = 2	6.61	1600	
1343	35	35°F = 2	6.65	1620	
<sup>approx</sup> 1354 49	50	35°F = 2	6.66	1620	
1355	65	35°F = 2	6.66	1620	
1401	80	35°F = 2	6.66	1640	
1409	100	35°F = 2	6.66	1610	

## Final Measurements:

Temperature 2 pH 6.66 Conductivity 1610 Alkalinity 770 mg/L CaCO<sub>3</sub>

meter not zeroing;  
value questionable

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 05-MW-06  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

Location: POL Tank Farm  
Weather: Clear, 56°F  
Samplers: SCB, TAC

Comments: \_\_\_\_\_  
\_\_\_\_\_

OVM Reading (ppm): \_\_\_\_\_  
 Water Depth (ft btoc): 14.13  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 30.9

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 48.55  
Saturated Thickness (ft): 34.42  
3 Borehole Volumes (gal): 83.6

Purge/Sample Method:

[illegible]

Final Measurements:

Temperature 4 pH 6.71 Conductivity 1050 Alkalinity 569 mg/L CaCO<sub>3</sub>

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 05-mw-67  
Date: 9-20-74  
Time: 1810

Location: Pump Station - Bore  
Weather: Cloudy, 36°F  
Samplers: Sully, mar.

Comments: No Cap on well = 0vm = 0.0.

OVM Reading (ppm): 0.00  
 Water Depth (ft btoc): ~~16.87~~ 16.69  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 10.5

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 28.5 ~~28.5~~ 28.38  
Saturated Thickness (ft): 11.69  
3 Borehole Volumes (gal): 31.5

Purge/Sample Method: purge w/ fertility pump. - sample w/ waterline

[illegible]

Temperature 3 pH 6.57 Conductivity 1170 Alkalinity

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 05-mw-11  
Date: 9/19/94  
Time: 15:25

Location: West POZ, near dorm  
Weather: Sunny, breezy, cool  
Samplers: BJC, SCH

Comments: Well casing has been broken on this well for a long time. No cap.

OVM Reading (ppm): 0  
Water Depth (ft btoc): 19.78  
Product Thickness (ft): \_\_\_\_\_  
Borehole Volume (gal): 7.29

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 27.88  
Saturated Thickness (ft): 8.10  
3 Borehole Volumes (gal): 19.68

Purge/Sample Method: purge w/utility pump - sample w/roto

[illegible]

Temperature 2.5 pH 6.57 Conductivity 1810 Alkalinity 969  $\mu\text{g/L CaCO}_3$

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 05-MW-13  
Date: 9-13-94  
Time: 1300

Location: East of Excom 200' Feet  
Weather: Med. Cloudy, 42°F  
Samplers: SCA, OAC

Comments: \_\_\_\_\_

OVM Reading (ppm): \_\_\_\_\_  
 Water Depth (ft btoc): 16.44  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 18.95

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 37.50  
Saturated Thickness (ft): 21.06  
3 Borehole Volumes (gal): 51.15 gallons

Purge/Sample Method: purge w/utility pump - sample w/Waters

[illegible]

Temperature 4 pH 6.36 Conductivity 1160 Alkalinity 608 mg/L CaCO<sub>3</sub>

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Location: TAR MAT, Runway over  
Weather: Cloudy 138°F  
Samplers: SIM B/C

Comments: pH meter checked.  $T = 7.03$   
conductivity needed tweaking: 1300 set to 1000.

OVM Reading (ppm): not functioning  
 Water Depth (ft btoc): 13.48  
 Product Thickness (ft): -  
 Borehole Volume (gal): 19.4

Product Depth (ft btoc):           
Well Depth (ft btoc): 35  
Saturated Thickness (ft): 21.5  
3 Borehole Volumes (gal): 58

Purge/Sample Method: purge w/ utility pump - sample w/ wattera

### Final Measurements:

Temperature 3 pH 6.55 Conductivity 800 Alkalinity 524

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 05-mw-15  
Date: 9/19/94  
Time: ~~10:50~~ 12:00 1050  
Sample

Location: POL  
Weather: Cold, sunny, Wind from East  
Samplers: B/C, S

Comments: Well has been grouted over flush cover very difficult to remove. Some bentonite in the well. Remove and replace Waterloo tubing

OVM Reading (ppm): not functioning  
 Water Depth (ft btoc): 14.75  
 Product Thickness (ft): -  
 Borehole Volume (gal): 18.5

Product Depth (ft btoc): —  
Well Depth (ft btoc): 35.35  
Saturated Thickness (ft): 20.6  
3 Borehole Volumes (gal): 55.5

Purge/Sample Method: purge

[illegible]

Temperature 34 pH 6.66 Conductivity 850 Alkalinity 509 mg/L CaCO<sub>3</sub>

## GROUNDWATER QUALITY SAMPLING LOG

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 06-MW-01  
Date: 9-17-94  
Time: 1650

Location: 06  
Weather: Cloudy - 44°F  
Samplers: 2, 10, 12

Comments: \_\_\_\_\_

### Field Measurements:

OVM Reading (ppm): \_\_\_\_\_  
 Water Depth (ft btoc): 21.41  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 28.17

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 52.71  
Saturated Thickness (ft): 31.32  
3 Borehole Volumes (gal): 76.0

Purge/Sample Method: purge w/ utility pump - Sample w/ Wattera.

[illegible]

### Final Measurements:

Temperature 6.5 pH 6.62 Conductivity 1390 Alkalinity 792  $\text{mg/L CaCO}_3$







**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 06-mw-04  
Date: 9-17-94  
Time: 1045

Location: Millon Cañon Hwy  
Weather: Cloudy, 35°F  
Samplers: Sw, 10m

Comments: \_\_\_\_\_  
\_\_\_\_\_

OVM Reading (ppm): \_\_\_\_\_  
 Water Depth (ft btoc): 13.62  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 3141

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 48.52  
Saturated Thickness (ft): 34.90  
3 Borehole Volumes (gal): 85.0

Purge/Sample Method: purge w/ actively pump - sample w/ waterline

[illegible]

Temperature 5.5 pH 6.62 Conductivity 1140 Alkalinity 643 mg/L CaCO<sub>3</sub>













**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 09-MW-03  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

Location: Million gallon tank  
Weather: Cloudy 39°F  
Samplers: SCA JAC

Comments:  $\text{TOL} = 143.78$  Sample at 12:50  
Initially very red/dark pink color —  $\text{Fe}^+$

OVM Reading (ppm): \_\_\_\_\_  
 Water Depth (ft btoc): 1347  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 29.8

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 46.59  
Saturated Thickness (ft): 33.12  
3 Borehole Volumes (gal): 89.4

Purge/Sample Method: Purge w/port. utility pump - Sample w/Water

[illegible]

Temperature 3 pH 6.79 Conductivity 1020 Alkalinity 438 mg/L CaCO<sub>3</sub>

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 09-MJ-04  
Date: 8 Sept 94  
Time: 12:00 Start.

Location: South M614  
Weather: Cool overcast - 0 45°  
Samplers: TAC SCH

Comments: no water proof cap on well, made up PVC.

OVM Reading (ppm): NA  
 Water Depth (ft btoc): 15.02  
 Product Thickness (ft): —  
 Borehole Volume (gal): 29.1

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 47.04  
Saturated Thickness (ft): 32.02  
3 Borehole Volumes (gal): 86.45

[illegible]

Temperature 24.0°C pH 7.86 Conductivity 840 Alkalinity 623 mg/L CaCO<sub>3</sub>

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 09-MW-05  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

Location: Million Gallon Hill  
Weather: Cloudy, 39°F  
Samplers: SCM/TAC

Comments:  $TOC = 141,34$

Samplers: SCM/17  
Sample well @ 18:36

Initially, fairly red, clearing @  $\approx 10$  gallons

Generators broke at 15:15 spent 2hrs 45 minutes repairing - finished well

OVM Reading (ppm): \_\_\_\_\_  
 Water Depth (ft btoc): 10.48  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 32

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 46.78  
Saturated Thickness (ft): 35.8  
3 Borehole Volumes (gal): 89

**Purge/Sample Method:**[illegible]

coarse sediment	
" "	

Temperature 3° pH 6.84 Conductivity 690 Alkalinity 443  $\mu\text{g/L}$

$$\text{CuCO}_3$$

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 09-MW-06  
Date: 9-10-94  
Time: 5:45 11:00

Location: \_\_\_\_\_  
Weather: Cloudy, 36.0°F  
Samplers: JCH, JMC

Comments: TOL = 140.41  
Sample @ 11:30  
Sample mostly clear entire time

OVM Reading (ppm): \_\_\_\_\_  
 Water Depth (ft btoc): 9.80  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 33

Product Depth (ft btoc):	
Well Depth (ft btoc):	46.52
Saturated Thickness (ft):	36.72
3 Borehole Volumes (gal):	99.14

Purge/Sample Method: Purge & sample w/ utility port. pump - Sample w/ Wattera pump

[illegible]

Temperature 3.0°C pH 6.79 Conductivity 350 Alkalinity 189 mg/L CaCO<sub>3</sub>

in

Well ID: 09-MW-08  
Date: 9-18-94  
Time: 1315

Location: million gallon hill  
Weather: partly cloudy  
Samplers: SCM MPD

Comments: \_\_\_\_\_

product top depth. 21.35

Product Depth (ft btoc): 21.74 bottom  
Well Depth (ft btoc): 28.71  
Saturated Thickness (ft): 7.35  
3 Borehole Volumes (gal): 1782

Purge/Sample Method: porge w/ utility pump Sample w/ waft hose

[illegible]

Temperature 51.5 pH 6.46 Conductivity 1280 Alkalinity 739  $\text{mg/L CaCO}_3$

## GROUNDWATER QUALITY SAMPLING LOG

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 09-MW-12  
Date: 9-18-94  
Time: 0932

Location: West of Missile Storage  
Weather: Cloudy, 36°  
Samplers: 5001, MHP

Comments: OVM in headspace w/ 8 ppm; cap had been off of well, though  
simple: very oily

**Field Measurements:**

OVM Reading (ppm): 8 ppm  
 Water Depth (ft btoc): 12.21 13.21  
 Product Thickness (ft): 1.00  
 Borehole Volume (gal): 7.5

product Top measurement = 12.21

Product Depth (ft btoc): 13.21 - Bottom

Well Depth (ft btoc): 21.63

Saturated Thickness (ft): 8.42

3 Borehole Volumes (gal): 20.46

Purge/Sample Method: purge w/utility pump - sample w/water

[illegible]

**Final Measurements:**

Temperature 5.5 pH 6.44 Conductivity 1460 Alkalinity 850  $\mu\text{g/L CaCO}_3$

## GROUNDWATER QUALITY SAMPLING LOG

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 09-MW-15  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

Location: SW of Alert Cell  
Weather: Partly Cloudy 39°F  
Samplers: SEA, TAC

Comments:  $TOC = 142.62$

**Field Measurements:**

OVM Reading (ppm): \_\_\_\_\_  
 Water Depth (ft btoc): 13.05  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 21.88

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 37.37  
Saturated Thickness (ft): 24.32  
3 Borehole Volumes (gal): 59.09

**Purge/Sample Method:**

[illegible]

### Final Measurements:

Temperature 4 pH 6.80 Conductivity 720 Alkalinity 401 mg/L CaCO<sub>3</sub>

**Project:** Galena Airport RI/FS  
**Client:** AECCE

Well ID: 10-MW-01  
Date: 9-17-94  
Time: 1504

Location: JP4 Fillstands  
Weather: Pt. Cloudy, 44°F  
Samplers: SW, MW2

Comments: Tax = 144,39

OVM Reading (ppm): \_\_\_\_\_  
 Water Depth (ft btoc): 15.23  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 28.2

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 46.58  
Saturated Thickness (ft): 31.35  
3 Borehole Volumes (gal): 76.14

Purge/Sample Method: purge w/ utility pump - sample w/ Nattera.

[illegible]

Temperature 5.5 pH 6.52 Conductivity 1220 Alkalinity 632 mg/L CaCO<sub>3</sub>



**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Date:

Time:

Weather Clear, 60°F

Samplers: SC H, DAC

Comments: TOL = 145.00

OVM Reading (ppm): 0.0 ppm  
 Water Depth (ft btoc): 14.94  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): 29.77

Well Depth (ft btoc): 47.47

Saturated Thickness (ft): 32.53

3 Borehole Volumes (gal): 79.0

**Purge/Sample Method:**

**Final Measurements:**

## Temperature

pH

### Conductivity

### Alkalinity

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Location: JPY Fullstands

Date: \_\_\_\_\_

## Weather

Time: \_\_\_\_\_

**Samplers:**

Comments: TOL = 143.05 Well not sampled due to  
damage from snow removal equipment

OVM Reading (ppm): \_\_\_\_\_  
 Water Depth (ft btoc): \_\_\_\_\_  
 Product Thickness (ft): \_\_\_\_\_  
 Borehole Volume (gal): \_\_\_\_\_

Product Depth (ft btoc):

Well Depth (ft btoc): \_\_\_\_\_

Saturated Thickness (ft): \_\_\_\_\_

3 Borehole Volumes (gal):

**Purge/Sample Method:**

[illegible]

Temperature \_\_\_\_\_ pH \_\_\_\_\_ Conductivity \_\_\_\_\_ Alkalinity \_\_\_\_\_

## GROUNDWATER QUALITY SAMPLING LOG

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 13-MW-037  
Date: 9/17/94  
Time: 1700

Location: Control Tower Drum Storage  
Weather: partly cloudy, breezy, cool  
Samplers: B/C/SCH

Comments: pH 7.0 buffer reads 7.04  
1000 conductivity buffer reads 1000

### Field Measurements:

OVM Reading (ppm): 8  
 Water Depth (ft btoc): 18.85  
 Product Thickness (ft): —  
 Borehole Volume (gal): 8.55

Product Depth (ft btoc): \_\_\_\_\_  
Well Depth (ft btoc): 28.33  
Saturated Thickness (ft): \_\_\_\_\_  
3 Borehole Volumes (gal): 25.65

Purge/Sample Method: purge with utility pump, sample w/ water

[illegible]

**Final Measurements:**

Temperature 3 pH 6.52 Conductivity 940 Alkalinity 508

**Project:** Galena Airport RI/FS  
**Client:** AFCEE

Well ID: 13-MW-038  
Date: 9/19/94  
Time: 18:55

Location: Control Tower Drum Storage  
Weather: partly cloudy, sprinkling, 60°/60°  
Samplers: BK SCH

Comments: pH 7 = 6.99  
cond 1000 = 1000  
Casing of well is heaved. Water in security casing, not in well

OVM Reading (ppm): 0  
 Water Depth (ft btoc): 17.94  
 Product Thickness (ft): -  
 Borehole Volume (gal): 8.9

Product Depth (ft btoc):             
Well Depth (ft btoc): 27.80  
Saturated Thickness (ft): 9.86  
3 Borehole Volumes (gal): 26.7

[illegible]

Temperature 3.5 pH 6.46 Conductivity 1040 Alkalinity 575

## **Water Level Survey Results**

## GALENA, ALASKA

## Monitoring Well Water Level Data

## 1993 Survey Data

## 4-JULY-92

## 29-JULY-92

## 15-AUG-93

Well I.D.	Northing	Easting	Elevation To TOC	H2O Depth (From TOC)	Total Depth (From TOC)	Water Elevation	H2O Depth (From TOC)	Total Depth (From TOC)	Water Elevation	H2O Depth (From TOC)	Total Depth (From TOC)	Water Elevation
01-MW-01	3925415.79	1811197.63	145.98							15.16		130.82
01-MW-02	3925631.78	1811354.63	145.50							14.82		130.68
01-MW-03	3925745.10	1811323.05	147.29	7.91	28.36	139.38	11.23	28.26	136.06	16.43		130.86
01-MW-04	3925634.72	1811183.64	144.79	5.75	22.68	139.04	8.67	22.66	136.12	13.92		130.87
01-MW-05	3925523.35	1811148.49	146.57	8.05	25.96	138.52	10.60	25.90	135.97	15.75		130.82
01-MW-06	3925450.64	1811349.18	147.27	7.86	26.81	139.41	11.28	26.81	135.99	16.20		131.07
01-MW-07	3925231.05	1811068.65	143.19							23.39		119.80
01-MW-08	3925198.04	1811266.41	153.49							22.07		131.42
04-MW-02	3925268.76	1812283.24	147.20							17.01		130.19
04-MW-03	3925460.08	1812401.51	145.55							14.49		131.06
05-MW-01	3926266.22	1804905.55	150.64							20.96	53.88	129.68
05-MW-02	3925967.52	1805428.72	149.51							19.85	53.48	129.66
05-MW-03	3926037.36	1805183.76	147.93									
05-MW-04	3926029.31	1805029.33	145.82							16.21	49.20	129.61
05-MW-05	3925969.98	1804904.41	145.57							16.09		129.48
05-MW-06	3926176.70	1804528.75	144.71							15.08	49.66	129.63
05-MW-07	3926111.00	1804843.18	145.91	6.78	28.37	139.13						
05-MW-08	3926573.32	1804993.75	145.73	6.52	28.90	139.21						
05-MW-09	3926898.84	1804765.31	147.31	8.20	28.63	139.11				17.38	28.63	129.93
05-MW-10	3926151.95	1805152.54	147.90	12.66	30.09	135.24				18.76	30.09	129.14
05-MW-11	3926508.77	1804453.98	149.13	10.25	23.18	138.88						
05-MW-12	3926157.70	1804305.71	147.16	8.60	25.03	138.56						
05-MW-13	3926306.86	1804190.23	147.01									
05-MW-14	3925586.00	1805078.00	142.05									
05-MW-15	3925725.23	1804486.96	143.34									
06-MW-01	3926640.00	1803588.76	151.30							21.70	52.41	129.60
06-MW-02	3926438.83	1803544.45	147.91							18.40	52.64	129.51
06-MW-03	3926136.57	1803300.78	144.59				16.28	48.70	128.31	15.24	48.36	129.35
06-MW-04	3926311.90	1803047.49	142.70							13.36	48.43	129.34
06-MW-05	3926368.72	1803214.00	144.14	5.16	18.01	138.98						
06-MW-06	3926311.42	1803740.11	148.92	9.93	30.01	138.99						
06-MW-07	3927008.19	1803826.28	151.90									
09-MW-01	3925887.18	1802988.49	142.55							13.31	48.45	129.24
09-MW-02	3925561.03	1802813.90	140.52							11.41	44.93	129.11
09-MW-03	3926365.99	1802303.17	143.78							14.54		129.24
09-MW-04	3926072.77	1802387.37	145.52							16.33		129.19
09-MW-05	3926630.27	1802495.32	141.34							11.99		129.35
09-MW-06	3926844.91	1802850.48	140.41							10.94		129.47
09-MW-07	3927135.32	1803116.58	143.67	4.94	23.71	138.73						
09-MW-08	3926230.77	1802612.25	150.21	15.66	28.65	134.55				21.91		128.30
09-MW-10	3926424.14	1802644.80	166.07									
09-MW-11	3926573.80	1802774.34	163.25									
09-MW-12	3926198.21	1802958.84	141.23	2.49	21.70	138.74				12.85		128.38
09-MW-14	3925903.33	1802573.13	146.92							17.74		129.18
09-MW-15	3925290.16	1802754.76	142.62									
10-MW-01	3926165.16	1803467.19	144.39				9.84	46.70	134.55	14.99		129.40
10-MW-02	3925989.13	1803620.63	144.62				10.61	47.79	134.01	15.26		129.36
10-MW-03	3925916.26	1803383.92	145.00				10.18	47.64	134.82	15.69	47.64	129.31
10-MW-04	3925545.84	1803251.22	143.05									
11-MW-01	No survey data for this well			2.55	18.39	-2.55				11.85	18.39	-11.85
11-MW-02	3926502.02	1803274.10	143.82	5.03	21.26	138.79						
12-MW-01	3924457.46	1804255.74	141.26									
12-MW-02	3924455.73	1804963.34	139.46							10.30		129.16

## GALENA, ALASKA

## Monitoring Well Water Level Data

## 1993 Survey Data

Well I.D.	Northing	Easting	Elevation To TOC	18-AUG-93			1-JULY-93			13-SEPT-93		
				H2O Depth (From TOC)	Total Depth (From TOC)	Water Elevation	H2O Depth (From TOC)	Total Depth (From TOC)	Water Elevation	H2O Depth (From TOC)	Total Depth (From TOC)	Water Elevation
01-MW-01	3925415.79	1811197.63	145.98							16.73	49.94	129.25
01-MW-02	3925631.78	1811354.63	145.50							15.29	29.52	130.21
01-MW-03	3925745.10	1811323.05	147.29							16.86	28.00	130.43
01-MW-04	3925634.72	1811183.64	144.79							14.58	22.39	130.21
01-MW-05	3925523.35	1811148.49	146.57							16.58	25.68	129.99
01-MW-06	3925450.64	1811349.18	147.27							16.41	26.81	130.86
01-MW-07	3925231.05	1811068.65	143.19									
01-MW-08	3925198.04	1811266.41	153.49									
04-MW-02	3925268.76	1812283.24	147.20				10.38	22.63	136.82	17.80	18.07	129.40
04-MW-03	3925460.08	1812401.51	145.55				12.81	17.77	132.74	13.84	22.72	131.71
05-MW-01	3926266.22	1804905.55	150.64	20.96	53.88	129.68	17.47	53.82	133.17	21.73	53.88	128.91
05-MW-02	3925967.52	1805428.72	149.51	19.84	53.48	129.66	16.35	53.12	133.16	20.78	53.48	128.73
05-MW-03	3926037.36	1805183.76	147.93	18.25		129.68	13.81	53.67	134.12	19.21	53.73	128.72
05-MW-04	3926029.31	1805029.33	145.82	16.25	49.20	129.57				17.72	49.20	128.10
05-MW-05	3925969.98	1804904.41	145.57							18.28	50.70	127.29
05-MW-06	3926176.70	1804528.75	144.71	15.08	49.66	129.63	10.66	29.14	134.05	15.81	49.66	128.90
05-MW-07	3926111.00	1804843.18	145.91	16.10		129.81				17.78	28.35	128.13
05-MW-08	3926573.32	1804993.75	145.73	15.79		129.94	11.23	28.44	134.50	16.39	28.79	129.34
05-MW-09	3926898.84	1804765.31	147.31	17.39	28.63	129.92	12.78	28.26	134.53	18.92	28.63	128.39
05-MW-10	3926151.95	1805152.54	147.90	18.80	30.09	129.10				19.99	30.06	127.91
05-MW-11	3926508.77	1804453.98	149.13				14.95	27.86	134.18			
05-MW-12	3926157.70	1804305.71	147.16				12.87	24.81	134.29			
05-MW-13	3926306.86	1804190.23	147.01									
05-MW-14	3925586.00	1805078.00	142.05									
05-MW-15	3925725.23	1804486.96	143.34									
06-MW-01	3926640.00	1803588.76	151.30	21.77	52.41	129.53	17.10	52.41				
06-MW-02	3926438.83	1803544.45	147.91	18.46	52.64	129.45	13.89	52.64	134.02			
06-MW-03	3926136.57	1803300.78	144.59	15.23	48.36	129.36	10.89	48.36	133.70			
06-MW-04	3926311.90	1803047.49	142.70	13.38	48.43	129.32	8.98	48.43	133.72			
06-MW-05	3926368.72	1803214.00	144.14	14.60		129.54	10.14	17.94	134.00			
06-MW-06	3926311.42	1803740.11	148.92	19.27		129.65	14.68	29.72	134.24			
06-MW-07	3927008.19	1803826.28	151.90									
09-MW-01	3925887.18	1802988.49	142.55	13.29	48.45	129.26	9.12	47.34	133.43	14.50	48.45	128.05
09-MW-02	3925561.03	1802813.90	140.52	11.37	44.93	129.15	7.35	44.93	133.17			
09-MW-03	3926365.99	1802303.17	143.78				10.25	46.96	133.53	16.52	47.24	127.26
09-MW-04	3926072.77	1802387.37	145.52				12.12	7.02	133.40	17.40	47.12	128.12
09-MW-05	3926630.27	1802495.32	141.34				7.55	47.00	133.79	12.71	47.10	128.63
09-MW-06	3926844.91	1802850.48	140.41				6.32	46.51	134.09	11.67	46.84	128.74
09-MW-07	3927135.32	1803116.58	143.67				9.35	23.65	134.32	14.69	23.74	128.98
09-MW-08	3926230.77	1802612.25	150.21									
09-MW-10	3926424.14	1802644.80	166.07									
09-MW-11	3926573.80	1802774.34	163.25									
09-MW-12	3926198.21	1802958.84	141.23									
09-MW-14	3925903.33	1802573.13	146.92				13.58	25.12	133.34	18.91	25.19	128.01
09-MW-15	3925290.16	1802754.76	142.62									
10-MW-01	3926165.16	1803467.19	144.39	15.00		129.39				15.88	46.44	128.51
10-MW-02	3925989.13	1803620.63	144.62	15.25		129.37				16.33	47.43	128.29
10-MW-03	3925916.26	1803383.92	145.00	15.67	47.64	129.33				16.84	47.58	128.16
10-MW-04	3925545.84	1803251.22	143.05									
11-MW-01	No survey data for this well			11.91	18.39	-11.91	7.30	18.2				
11-MW-02	3926502.02	1803274.10	143.82	14.43		129.39	9.87	21.26	133.95			
12-MW-01	3924457.46	1804255.74	141.26				8.49	28.77	132.77	14.27	28.93	126.99
12-MW-02	3924455.73	1804963.34	139.46				6.45	25.31	133.01	12.28	26.13	127.18

## GALENA, ALASKA

## Monitoring Well Water Level Data

## 1993 Survey Data

## 06-OCT-93

## 9-JAN-94

## 19-APR-94

Well I.D.	Northing	Easting	Elevation To TOC	06-OCT-93			9-JAN-94			19-APR-94		
				H2O Depth (From TOC)	Total Depth (From TOC)	Water Elevation	H2O Depth (From TOC)	Total Depth (From TOC)	Water Elevation	H2O Depth (From TOC)	Total Depth (From TOC)	Water Elevation
01-MW-01	3925415.79	1811197.63	145.98									
01-MW-02	3925631.78	1811354.63	145.50									
01-MW-03	3925745.10	1811323.05	147.29									
01-MW-04	3925634.72	1811183.64	144.79									
01-MW-05	3925523.35	1811148.49	146.57									
01-MW-06	3925450.64	1811349.18	147.27									
01-MW-07	3925231.05	1811068.65	143.19									
01-MW-08	3925198.04	1811266.41	153.49									
04-MW-02	3925268.76	1812283.24	147.20									
04-MW-03	3925460.08	1812401.51	145.55									
05-MW-01	3926266.22	1804905.55	150.64	21.31	53.88	129.33	28.07		122.57			
05-MW-02	3925967.52	1805428.72	149.51	20.38	53.48	129.13	26.89		122.62	32.01		117.50
05-MW-03	3926037.36	1805183.76	147.93	18.78	53.73	129.15	25.4		122.53			
05-MW-04	3926029.31	1805029.33	145.82	16.91	49.20	128.91						
05-MW-05	3925969.98	1804904.41	145.57							27.69		117.88
05-MW-06	3926176.70	1804528.75	144.71	15.45	49.66	129.26	22.27		122.44	27.38		117.33
05-MW-07	3926111.00	1804843.18	145.91	16.36		129.55	24.28		121.63			
05-MW-08	3926573.32	1804993.75	145.73	16.00	28.9	129.73	23.65		122.08	27.93		117.80
05-MW-09	3926898.84	1804765.31	147.31	17.67	28.63	129.64	25.77		121.54			
05-MW-10	3926151.95	1805152.54	147.90	18.49	30.09	129.41						
05-MW-11	3926508.77	1804453.98	149.13				26.77		122.36			
05-MW-12	3926157.70	1804305.71	147.16	17.74	25.03	129.42	25.93		121.23			
05-MW-13	3926306.86	1804190.23	147.01	17.69		129.32	24.57		122.44			
05-MW-14	3925586.00	1805078.00	142.05									
05-MW-15	3925725.23	1804486.96	143.34				20.94		122.40			
06-MW-01	3926640.00	1803588.76	151.30	21.90	52.41	129.40	28.78		122.52			
06-MW-02	3926438.83	1803544.45	147.91	18.67	52.64	129.24	25.45		122.46	30.50		117.41
06-MW-03	3926136.57	1803300.78	144.59	15.75	48.7	128.84	22.19		122.40	27.40		117.19
06-MW-04	3926311.90	1803047.49	142.70	13.82	48.43	128.88	20.38		122.32			
06-MW-05	3926368.72	1803214.00	144.14	14.95	18.01	129.19						
06-MW-06	3926311.42	1803740.11	148.92	19.51	30.01	129.41	26.3		122.62	29.78		119.14
06-MW-07	3927008.19	1803826.28	151.90	22.51		129.39	29.35		122.55			
09-MW-01	3925887.18	1802988.49	142.55	14.05	48.45	128.50	20.21		122.34	25.46		117.09
09-MW-02	3925561.03	1802813.90	140.52	12.49	44.93	128.03						
09-MW-03	3926365.99	1802303.17	143.78							26.49		117.29
09-MW-04	3926072.77	1802387.37	145.52							28.38		117.14
09-MW-05	3926630.27	1802495.32	141.34							24.12		117.22
09-MW-06	3926844.91	1802850.48	140.41							22.98		117.43
09-MW-07	3927135.32	1803116.58	143.67									
09-MW-08	3926230.77	1802612.25	150.21									
09-MW-10	3926424.14	1802644.80	166.07									
09-MW-11	3926573.80	1802774.34	163.25									
09-MW-12	3926198.21	1802958.84	141.23									
09-MW-14	3925903.33	1802573.13	146.92							25.15		121.77
09-MW-15	3925290.16	1802754.76	142.62	14.97		127.65	20.36		122.26	25.67		116.95
10-MW-01	3926165.16	1803467.19	144.39				21.96		122.43			
10-MW-02	3925989.13	1803620.63	144.62									
10-MW-03	3925916.26	1803383.92	145.00	16.38	47.64	128.62	22.68		122.32	28.01		116.99
10-MW-04	3925545.84	1803251.22	143.05	14.95		128.10	20.85		122.20			
11-MW-01	No survey data for this well			12.09	18.39	-12.09						
11-MW-02	3926502.02	1803274.10	143.82	14.66	21.26	129.16						
12-MW-01	3924457.46	1804255.74	141.26									
12-MW-02	3924455.73	1804963.34	139.46									



## GALENA, ALASKA

## Monitoring Well Water Level Data

## 1993 Survey Data

24 SEP-94

Well I.D.	Northing	Easting	Elevation To TOC	H2O Depth (From TOC)	Total Depth (From TOC)	Water Elevation
01-MW-01	3925415.79	1811197.63	145.98			
01-MW-02	3925631.78	1811354.63	145.50			
01-MW-03	3925745.10	1811323.05	147.29			
01-MW-04	3925634.72	1811183.64	144.79			
01-MW-05	3925523.35	1811148.49	146.57			
01-MW-06	3925450.64	1811349.18	147.27			
01-MW-07	3925231.05	1811068.65	143.19			
01-MW-08	3925198.04	1811266.41	153.49			
04-MW-02	3925268.76	1812283.24	147.20			
04-MW-03	3925460.08	1812401.51	145.55			
05-MW-01	3926266.22	1804905.55	150.64			
05-MW-02	3925967.52	1805428.72	149.51	21.56		127.95
05-MW-03	3926037.36	1805183.76	147.93			
05-MW-04	3926029.31	1805029.33	145.82			
05-MW-05	3925969.98	1804904.41	145.57			
05-MW-06	3926176.70	1804528.75	144.71	16.69		128.02
05-MW-07	3926111.00	1804843.18	145.91			
05-MW-08	3926573.32	1804993.75	145.73	17.16		128.57
05-MW-09	3926898.84	1804765.31	147.31			
05-MW-10	3926151.95	1805152.54	147.90			
05-MW-11	3926508.77	1804453.98	149.13	20.63		128.50
05-MW-12	3926157.70	1804305.71	147.16	18.89		128.27
05-MW-13	3926306.86	1804190.23	147.01	18.72		128.29
05-MW-14	3925586.00	1805078.00	142.05	19.29		122.76
05-MW-15	3925725.23	1804486.96	143.34	15.92		127.42
06-MW-01	3926640.00	1803588.76	151.30	22.87		128.43
06-MW-02	3926438.83	1803544.45	147.91	19.78		128.13
06-MW-03	3926136.57	1803300.78	144.59	17.00		127.59
06-MW-04	3926311.90	1803047.49	142.70	14.99		127.71
06-MW-05	3926368.72	1803214.00	144.14	16.19		127.95
06-MW-06	3926311.42	1803740.11	148.92	20.62		128.30
06-MW-07	3927008.19	1803826.28	151.90	23.30		128.60
09-MW-01	3925887.18	1802988.49	142.55	15.37		127.18
09-MW-02	3925561.03	1802813.90	140.52	13.84		126.68
09-MW-03	3926365.99	1802303.17	143.78	16.15		127.63
09-MW-04	3926072.77	1802387.37	145.52	18.20		127.32
09-MW-05	3926630.27	1802495.32	141.34	13.48		127.86
09-MW-06	3926844.91	1802850.48	140.41	12.17		128.24
09-MW-07	3927135.32	1803116.58	143.67	15.03		128.64
09-MW-08	3926230.77	1802612.25	150.21			
09-MW-10	3926424.14	1802644.80	166.07			
09-MW-11	3926573.80	1802774.34	163.25			
09-MW-12	3926198.21	1802958.84	141.23			
09-MW-14	3925903.33	1802573.13	146.92			
09-MW-15	3925290.16	1802754.76	142.62			
10-MW-01	3926165.16	1803467.19	144.39	16.81		127.58
10-MW-02	3925989.13	1803620.63	144.62			
10-MW-03	3925916.26	1803383.92	145.00	17.77		127.23
10-MW-04	3925545.84	1803251.22	143.05			
11-MW-01	No survey data for this well					
11-MW-02	3926502.02	1803274.10	143.82	15.76		128.06
12-MW-01	3924457.46	1804255.74	141.26			
12-MW-02	3924455.73	1804963.34	139.46			

**1992 Survey Data**

# RADIAN CORPORATION

Galena and Campion AFS, Alaska

## SAMPLE LOCATIONS

### Site 01 (Fire Training Site)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
01-SD-01		1163	3925849	1811179	144.0
01-SD-02		1169	3925653	1811507	144.2
01-MW-01	145.93	1158	3925416	1811198	143.2
01-MW-02	145.47	1161	3925632	1811355	143.1
01-MW-03	147.08	1162	3925745	1811323	144.7
01-MW-04	144.53	1145	3925635	1811184	142.7
01-MW-05	146.30	1160	3925523	1811149	143.4
01-MW-06	147.03	1157	3925451	1811350	143.7
01-SB-01		1148	3925639	1811297	143.2
01-SB-02		1152	3925522	1811249	142.7
01-SS-01		1159	3925460	1811193	143.0
01-SS-02		1151	3925500	1811220	142.8
01-SS-03		1153	3925480	1811265	142.5
01-SS-04		1156	3925432	1811360	144.4
01-SS-05		1154	3925503	1811285	142.7
01-SS-06		1155	3925535	1811310	142.8
01-SS-07		1147	3925576	1811244	142.7
01-SS-08		1146	3925593	1811252	142.1
01-SS-09		1150	3925609	1811182	142.9
01-SS-10		1149	3925672	1811281	143.9
01-SW-01		1164	3925885	1810891	143.7
01-SW-02		1168	3925664	1811542	143.2

### Site 04 (Ambient Site)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
04-SD-01		1166	3925152	1811943	145.8
04-SD-02		1165	3925424	1811918	145.7
04-SD-03		1175	3925489	1812169	145.3
04-SD-04		1174	3925663	1812363	145.1
04-MW-02	147.14	1167	3925269	1812284	147.4
04-MW-03	145.50	1171	3925460	1812402	146.0
04-SS-01		1173	3925682	1812558	147.2
04-SS-02		1170	3925327	1812408	147.4
04-SS-03		1172	3925486	1812605	150.1
04-SW-01		1166	3925152	1811943	145.8
04-SW-02		1165	3925424	1811918	145.7
04-SW-03		1175	3925489	1812169	145.3
04-SW-04		1174	3925663	1812363	145.1

# Site 05 (POL)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
05-SD-01		1144	3926401	1805059	142.2
05-SD-02		1130	3926508	1805228	136.8
05-MW-01	150.66	1106	3926266	1804906	148.5
05-MW-02	149.55	1126	3925967	1805429	147.4
05-MW-03	147.97	1122	3926037	1805184	145.8
05-MW-04	145.84	1121	3926029	1805030	143.6
05-MW-05	145.58	1124	3925970	1804904	143.2
05-MW-06	144.58	1116	3926176	1804529	142.4
05-MW-07	145.74	1100	3926111	1804843	143.1
05-MW-08	145.42	1105	3926573	1804994	141.8
05-MW-09	147.08	1104	3926899	1804766	145.0
05-MW-10	147.69	1110	3926152	1805153	145.0
05-MW-11	149.13	1127	3926509	1804454	146.2
05-MW-12	146.97	1125	3926157	1804306	145.3
05-SB-01		1107	3926260	1804959	144.3
05-SB-02		1114	3926083	1804968	144.0
05-SB-03		1111	3926138	1805191	146.3
05-SS-01		1128	3926537	1804511	147.4
05-SS-02		1103	3926445	1804697	145.4
05-SS-03		1102	3926380	1804752	143.5
05-SS-04		1108	3926306	1804963	144.7
05-SS-05		1113	3926279	1805078	145.2
05-SS-06		1143	3926216	1804914	144.1
05-SS-07		1109	3926208	1804996	144.9
05-SS-08		1112	3926219	1805215	144.3
05-SS-09		1115	3926129	1804894	143.8
05-SS-10		1101	3926192	1804771	143.3
05-SS-11		1120	3926020	1805026	143.3
05-SS-12		1117	3926179	1804646	143.0
05-SS-13		1118	3926131	1804711	143.2
05-SS-14		1123	3926076	1805216	142.5
05-SS-15		1119	3926089	1804857	142.8
05-SW-01		1131	3926623	1805137	136.2
05-SW-02		1130	3926508	1805228	136.8
05-SW-03		1129	3926397	1805307	137.0
05-RW-01	146.57	1133	3926131	1805104	144.3
05-RW-02	146.08	1132	3926093	1804964	143.9

## Site 06 (Waste Accumulation Area)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
06-SD-01		1239	3926496	1803249	137.5
06-SD-02		1232	3926328	1803037	137.4
06-MW-01	151.30	1194	3926640	1803589	148.8
06-MW-02	147.92	1193	3926439	1803544	145.3
06-MW-03	144.60	1198	3926137	1803301	142.4
06-MW-04	142.71	1230	3926312	1803047	140.6
06-MW-05	143.91	1233	3926369	1803213	140.9
06-MW-06	148.72	1203	3926311	1803741	146.4
06-SB-01		1234	3926443	1803253	145.8
06-SB-02		1214	3926186	1803302	142.1
06-SS-01		1235	3926428	1803304	145.5
06-SS-02		1196	3926317	1803348	141.4
06-SS-03		1197	3926212	1803303	142.4
06-SS-04		1204	3926332	1803759	146.3
06-SS-05		1195	3926300	1803678	145.7
06-SS-06		1205	3926271	1803755	145.5
06-SW-01		1238	3926524	1803245	134.8
06-SW-02		1229	3926204	1802935	135.0

## Site 07 (Campion)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
07-SB-01		1189	3914398	1840031	365.4
07-SB-02		1190	3914517	1839985	365.1
07-SB-03		1188	3914537	1840237	358.5
07-SD-01		1183	3914532	1840248	358.2
07-SD-02		1187	3914639	1840506	347.3
07-MW-01	370.54	1181	3914277	1840068	368.4
07-MW-02	362.92	1182	3914547	1840139	360.5
07-MW-03	368.52	1177	3914671	1839895	365.7
07-MW-04	390.08	1191	3914455	1839655	387.8
07-SS-01		1176	3914582	1839833	369.5
07-SS-02		1180	3914451	1840089	362.7
07-SS-03		1178	3914552	1840045	362.7
07-SS-04		1184	3914562	1840356	353.5
07-SS-05		1186	3914621	1840459	349.3
07-SW-01		1179	3914518	1840067	362.6
07-SW-02		1185	3914563	1840369	353.3

### Site 09 (Million Gallon Hill)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
09-MW-01	142.54	1215	3925887	1802988	140.4
09-MW-02	140.52	1219	3925561	1802814	141.0
09-MW-03	143.77	1223	3926366	1802304	141.5
09-MW-04	145.49	1216	3926073	1802387	143.2
09-MW-05	141.24	1224	3926630	1802495	139.0
09-MW-06	140.38	1226	3926845	1802849	137.9
09-MW-07	143.68	1192	3927135	1803117	144.3
09-MW-08	150.26	1218	3926230	1802612	150.5
09-MW-10	166.06	1221	3926424	1802645	166.4
09-MW-11	163.27	1222	3926574	1802775	163.6
09-MW-12	141.23	1228	3926198	1802959	141.7
09-MW-14	146.86	1217	3925904	1802573	143.7
09-SS-01		1227	3926553	1802863	156.3
09-SS-02		1225	3926689	1802614	141.1
09-SS-03		1220	3926264	1802463	141.2

### Site10 (Vehicle Maintenance Building)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
10-MW-01	144.30	1200	3926165	1803467	141.7
10-MW-02	144.63	1206	3925989	1803621	142.4
10-MW-03	145.00	1211	3925916	1803384	142.7
10-SB-01		1199	3926101	1803344	142.3
10-SB-02		1202	3926068	1803522	141.5
10-SB-03		1210	3925916	1803460	141.6
10-SS-01		1201	3926090	1803527	141.1
10-SS-02		1213	3926012	1803478	141.9
10-SS-03		1208	3925988	1803556	142.7
10-SS-04		1212	3925950	1803371	141.3
10-SS-05		1207	3925975	1803727	142.1
10-SS-06		1209	3925947	1803519	139.3

### Site11 (Underground Storage Tank)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
11-MW-02	143.83	1237	3926502	1803274	144.4
11-SB-01		1231	3926321	1803056	139.9
11-SS-01		1236	3926503	1803286	145.4

### Site12 (South of Airstrip)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
12-MW-01	141.23	1253	3924457	1804256	141.7
12-MW-02	139.45	1252	3924456	1804963	139.9

### SVE Locations (Extraction Well)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
I-1		1136	3926108	1804887	148.1
I-2		1142	3926177	1804942	144.2
I-3		1134	3926249	1804890	149.0
V-1		1139	3926157	1804838	148.4
V-2		1138	3926137	1804859	148.4
V-3		1137	3926117	1804879	148.2
V-4		1141	3926230	1804868	149.0
V-5		1140	3926199	1804836	148.9

### Building Corner Locations

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
A		1248	3926401	1803648	149.1
B		1241	3926365	1803639	148.8
C		1242	3926303	1803653	145.7
D		1243	3926283	1803653	145.5
E		1244	3926303	1803674	145.6
F		1245	3926283	1803602	146.0
G		1246	3926249	1803602	145.8
H		1247	3926249	1803636	146.1
I		1249	3926250	1803674	145.8
J		1250	3925906	1803780	144.0
K		1251	3925914	1803779	143.9
L		1263	3926260	1803674	
M		1264	3926281	1803674	

### Wells Located Inside Buildings (See Field Book Sketch)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
WELL #1		1271	3925910	1803784	
WELL #2		1268	3926254	1803668	
WELL #3		1267	3926266	1803683	
WELL #4		1262	3926383	1803658	

### Private Well Locations (See Field Book Sketch)

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
PRIVATE WELL		1255	3923857	1806877	149.4
PRIVATE WELL		1256	3923918	1806853	149.2
2 PRIV.WELLS		1254	3923458	1805445	124.5

### Exstraction Well Location

DESCRIPTION	TOP OF WELL ELEVATION	POINT #	NORTHING	EASTING	GROUND ELEVATION
EXT. WELL		1135	3926172	1804813	150.0



**1993 Survey Data**

## 1993 Survey Data

Description	Point #	Northing	Easting	Ground Elevation or Top of Well Casing
<b>Fire Protection Training Area</b>				
01-MW-01	47	3925416	1811198	145.98
01-MW-02	43	3925632	1811355	145.50
01-MW-03	44	3925745	1811323	147.29
01-MW-04	45	3925635	1811184	144.79
01-MW-05	46	3925523	1811148	146.57
01-MW-06	48	3925451	1811349	147.27
01-MW-07	148	3925231	1811069	143.19
01-MW-08	149	3925198	1811266	153.49
01-SB-03	267	3925319	1811244	146.33
01-SB-04	268	3925208	1811228	151.00
<b>Galena Ambient Location</b>				
04-MW-02	50	3925269	1812283	147.20
04-MW-03	51	3925460	1812402	145.55
<b>POL Tank Farm</b>				
05-MW-01	94	3926266	1804906	150.64
05-MW-02	89	3925968	1805429	149.51
05-MW-03	88	3926037	1805184	147.93
05-MW-04	87	3926029	1805029	145.82
05-MW-05	86	3925970	1804904	145.57
05-MW-06	79	3926177	1804529	144.71
05-MW-07	90	3926111	1804843	145.91
05-MW-08	95	3926573	1804994	145.73
05-MW-09	96	3926899	1804765	147.31
05-MW-10	91	3926152	1805153	147.90
05-MW-11	92	3926509	1804454	149.13
05-MW-12	77	3926158	1804306	147.16
05-MW-13	126	3926307	1804190	147.01
05-MW-14	143	3924798	1801950	142.05
05-MW-15	142	3925725	1804487	143.34
05-SB-04	181	3926603	1804295	148.01
05-SB-05	182	3926405	1804398	146.16
05-SB-06	184	3926531	1804509	147.24
05-SS-16	139	3926536	1804600	147.55
05-SS-17	135	3926407	1804627	146.52
05-SS-18	183	3926324	1804719	145.47
05-SS-19	136	3926256	1804796	145.49
05-SS-20	137	3926155	1805004	144.21

### 1993 Survey Data (Continued)

Description	Point #	Northing	Easting	Ground Elevation or Top of Well Casing
05-SS-21	138	3926112	1805163	148.56
05-SS-22	134	3926032	1804954	143.51
<b>West Unit</b>				
06-MW-01	58	3926640	1803589	151.30
06-MW-02	30	3926439	1803544	147.91
06-MW-03	32	3926137	1803301	144.59
06-MW-04	54	3926312	1803047	142.70
06-MW-05	55	3926369	1803214	144.14
06-MW-06	57	3926311	1803740	148.92
06-MW-07	125	3927008	1803826	151.90
06-SB-03	186	3926623	1803483	148.32
06-SS-07	124	3926371	1803752	148.85
06-SS-08	104	3926401	1803759	147.23
06-SS-09	103	3926394	1803690	148.92
06-SS-10	102	3926353	1803645	148.00
06-SS-11	100	3926385	1803522	144.33
06-SS-12	99	3926434	1803557	145.39
06-SS-13	105	3926419	1803477	144.03
06-SS-14	101	3926290	1803572	144.64
09-MW-01	34	3925887	1802988	142.55
09-MW-02	28	3925561	1802814	140.52
09-MW-03	65	3926366	1802303	143.78
09-MW-04	62	3926073	1802387	145.52
09-MW-05	66	3926630	1802495	141.34
09-MW-06	69	3926845	1802850	140.41
09-MW-07	72	3927135	1803117	143.67
09-MW-08	64	3926231	1802612	150.21
09-MW-10	73	3926424	1802645	166.07
09-MW-11	74	3926574	1802774	163.25
09-MW-12	53	3926198	1802959	141.23
09-MW-14	39	3925903	1802573	146.92
09-MW-15	140	3925290	1802755	142.62
09-SB-01	262	3925616	1802858	142.14
10-MW-01	56	3926165	1803467	144.39
10-MW-02	31	3925989	1803621	144.62
10-MW-03	33	3925916	1803384	145.00
10-MW-04	141	3925546	1803251	143.05
10-SB-04	187	3926121	1803477	141.51

## 1993 Survey Data (Continued)

Description	Point #	Northing	Easting	Ground Elevation or Top of Well Casing
10-SB-05	188	3926025	1803545	142.76
10-SS-07	117	3926035	1803609	140.47
10-SS-08	118	3925959	1803622	139.49
10-SS-09	119	3925961	1803589	139.82
10-SS-10	120	3925988	1803531	142.12
10-SS-11	121	3925953	1803491	139.35
10-SS-12	122	3925993	1803497	142.25
11-MW-02	61	3926502	1803274	143.82
11-SS-02	109	3926500	1803379	145.36
11-SS-03	110	3926600	1803462	147.06
11-SS-04	114	3926575	1803343	144.99
11-SS-05	116	3926609	1803281	140.67
11-SS-06	115	3926499	1803317	145.34
11-SS-07	113	3926414	1803208	140.81
11-SS-08	112	3926399	1803383	145.27
11-SS-09	106	3926322	1803408	142.50
11-SS-10	107	3926309	1803258	140.53
<b>Control Tower Drum Storage Area</b>				
MW-037	144	3925735	1805639	148.74
MW-038	145	3925532	1805640	146.80
MW-039	146	3925546	1806006	146.94
<b>Campion POL Area</b>				
07-MW-01	279	3914277	1840067	371.09
07-MW-02	278	3914547	1840140	363.46
07-MW-03	277	3914671	1839895	369.22
07-MW-04	276	3914456	1839655	390.08
07-SD-03	285	3914661	1840708	337.11
07-SD-04	286	3914695	1840892	328.65
07-SD-05	288	3914694	1841099	317.63
07-SD-06	291	3914737	1841295	305.19
07-SD-07	290	3914772	1841489	295.24
07-SS-06	281	3914466	1840159	361.14
07-SS-07	282	3914528	1840297	356.37
<b>Base Supply Wells</b>				
No. 2	292	1.00e-09	1.00e-09	145.47
<b>Treatability Study Air Sparging Wells</b>				
A-1	249	3926085	1805029	148.39
A-10	211	3926070	1805189	143.70

### 1993 Survey Data (Continued)

Description	Point #	Northing	Easting	Ground Elevation or Top of Well Casing
A-11	212	3926066	1805203	143.44
A-12	213	3926061	1805219	143.59
A-13	214	3926056	1805236	144.22
A-14	215	3926051	1805249	144.78
A-2	237	3926077	1805047	143.82
A-3	238	3926072	1805061	143.19
A-4	239	3926066	1805077	143.00
A-5	240	3926061	1805092	143.37
A-6	241	3926055	1805107	144.67
A-7	242	3926049	1805122	145.27
A-8	209	3926079	1805157	144.27
A-9	210	3926074	1805173	144.06
<b>Treatability Study Soil Sample Locations</b>				
B-1	254	3926054	1805035	143.80
B-10	261	3926075	1805207	143.26
B-11	256	3926029	1805163	146.68
B-12	257	3926023	1805179	147.19
B-17	201	3926034	1805201	145.43
B-2	250	3926095	1805051	148.84
B-3	251	3926082	1805084	143.69
B-4	253	3926047	1805091	145.83
B-5	252	3926026	1805104	147.50
B-6	255	3926029	1805041	145.40
B-7	258	3926063	1805159	145.13
B-8	259	3926059	1805172	145.44
B-9	260	3926085	1805178	144.05
<b>Treatability Study Extraction Wells</b>				
E-1	235	3926052	1805063	143.74
E-2	217	3926046	1805197	145.10
<b>Treatability Study Monitoring Wells</b>				
MW-2	236	3926060	1805066	142.87
MW-3	234	3926039	1805058	146.37
MW-6	204	3926056	1805197	144.30
<b>Treatability Study Steam Points</b>				
S-1	248	3926090	1805043	148.63
S-2	247	3926083	1805059	144.07
S-3	246	3926079	1805073	142.95
S-4	245	3926073	1805088	142.95

### 1993 Survey Data (Continued)

Description	Point #	Northing	Easting	Ground Elevation or Top of Well Casing
S-5	244	3926068	1805103	143.66
S-6	243	3926063	1805118	144.93
<b>Treatability Study Vapor Probes</b>				
V-1	230	3926065	1805059	143.08
V-10	228	3926085	1805109	144.04
V-11	208	3926065	1805171	144.81
V-12	207	3926055	1805168	145.12
V-13	206	3926045	1805165	145.24
V-14	199	3926036	1805161	145.85
V-15	203	3926054	1805208	144.27
V-16	202	3926044	1805205	145.06
V-18	200	3926023	1805199	145.67
V-19	198	3926038	1805151	145.47
V-2	231	3926055	1805055	142.92
V-20	197	3926042	1805140	145.63
V-3	232	3926045	1805052	144.48
V-4	233	3926035	1805048	145.94
V-5	227	3926051	1805095	144.71
V-6	226	3926042	1805094	146.15
V-7	225	3926032	1805095	146.75
V-8	224	3926023	1805095	147.40
V-9	229	3926090	1805088	144.07
<b>Treatability Study Air Sampling Stations</b>				
SP-1	42	3924461	1803983	156.95
SP-2 (new)	270	3923916	1807626	151.08
SP-2 (old)	41	3924501	1806943	143.03
SP-3	194	3926159	1804527	142.25
SP-4	185	3926870	1804726	150.12
SP-5	195	3925891	1805108	144.21
SP-6	158	3925866	1808987	157.91
<b>Yukon River</b>				
River Measure Point	49	3924869	1812194	149.18
Old River Gauge--150' mark	293	1.00e-09	1.00e-09	149.32
North edge of Yukon River Bank--top water	15	3924630	1811166	131.90
North edge of Yukon River Bank--top water	24	3924370	1802772	131.28
North edge of Yukon River Bank--top water	23	3924499	1802416	131.17
North edge of Yukon River Bank--top water	22	3923611	1807687	131.60
North edge of Yukon River Bank--top water	20	3923773	1805220	131.11

### 1993 Survey Data (Continued)

Description	Point #	Northing	Easting	Ground Elevation or Top of Well Casing
North edge of Yukon River Bank--top water	19	3923483	1806553	131.45
North edge of Yukon River Bank--top water	18	3923842	1808648	131.57
North edge of Yukon River Bank--top water	16	3924390	1810399	131.82
North edge of Yukon River Bank--top water	25	3924263	1803413	131.33
North edge of Yukon River Bank--top water	26	3923960	1804273	131.54
North edge of Yukon River Bank--top water	17	3924035	1809350	131.66
North edge of Yukon River Bank--top water	14	3925376	1813128	131.96
North edge of Yukon River Bank--top water	27	3924760	1801956	131.08
<b>Pump Test Wells</b>				
KV-1	128	3926180	1804512	146.02
KV-2	131	3926173	1804538	146.01
KV-3	132	3926167	1804527	145.64
KV-4a	133	3926157	1804538	145.94
KV-5	127	3926165	1804513	145.21
KV-6a	129	3926186	1804530	145.56
PW-1	130	3926182	1804546	146.11
<b>Miscellaneous</b>				
12-MW-01	7	3924457	1804256	141.26
12-MW-02	8	3924456	1804963	139.46
STA #8 (R&M Basis of Coord.)	1	3925110	1803535	142.60
Stake Furthest NW-West Runway	171	3925986	1802195	141.75

**APPENDIX F**

**Hydrocarbon Recovery Testing at Galena Airport**



The purpose of this Appendix is to document the results and draw some preliminary conclusions and recommendations from the hydrocarbon recovery testing performed at Galena Airport during 17-19 September 1992, 12-23 July 1993, and 13-16 April 1994. More detailed results and discussion of these tests is provided in the *Treatability Study Final Report* (USAF/Radian, January 1995).

The feasibility of recovery of light, non-aqueous phase hydrocarbons (LNAPL) using product skimming was determined using two methods: 1) baildown testing (1992, 1993, and 1994) and 2) hydrocarbon recovery (skimming) tests (1993 and 1994). Baildown testing was performed on 5 wells in the POL area (05-RW-1, 05-RW-2, 05-MW-04, 05-W-2, and 05-MW-10) and 1 well in the Million Gallon Hill area (05-MW-08). The baildown testing was used to determine if a skimming test was practical. Of the five wells, skimming tests were performed at three of the wells in POL (05-RW-1, 05-RW-2, and 05-MW-10) during 1993 and one well (05-RW-2) in 1994.

### **1992 Baildown Tests**

During the final stages of the 1992 Galena field season, two 6-in. Diameter hydrocarbon recovery wells were installed in the POL (05-RW-01 and 05-RW-02). These wells were located in areas of known occurrence of floating product. A hydrocarbon recovery system (SOS product-only system) and a portable air compressor were purchased and shipped to Galena to conduct field recovery tests. The close of 1992 field activities prevented the testing of the hydrocarbon skimmer system in the recovery wells. However, two short duration (3 day) baildown tests were conducted on recovery well 05-RW-01 and a nearby standard 2-in. Monitoring well (05-MW-10). The results of the baildown tests are shown in Figures 1 and 2.

Both the 6-in. and 2-in. wells displayed similar water and product level behavior during the baildown tests. An LNAPL layer, which was originally around 1.5 ft thick in the wells, was nearly completely removed by bailing at the start of the test. Following baildown, the

amount of free product recovered slowly throughout the monitoring period. Maximum apparent product thicknesses observed following baildown were around 0.4 ft.

Analysis of the data focused on determining the inflection point on the water level versus time recovery curve. According to Gruszczenski (1987), the actual formation thickness corresponds to this inflection point. In other words, after the product level in the well is reduced by pumping or bailing, the water level first rises and then falls. The point where the water level starts to fall is the inflection point. The product thickness at that point is the estimated true LNAPL thickness in the formation. Generally, there is a 70 to 95 percent reduction between the apparent hydrocarbon thickness observed in a well and the true formation thickness.

For well 05-RW-01, an inflection point in water levels was observed rather quickly (within 90 minutes), with a second leveling off inflection point after about 2600 minutes. The product thickness corresponding with the first inflection point was 0.15 ft. For monitor well 05-MW-10, the inflection point occurred even more quickly, after only 30 minutes. The corresponding product thickness was 0.03 ft. The different responses for the two wells may reflect the differences in casing diameters. Because the magnitude of the water level change in both wells was so small and occurred so rapidly, there is some uncertainty as to the validity of the true product thickness estimates.

### **1993 Baildown and Skimming Test**

The goals of the baildown and skimming tests conducted in 1993 were twofold: 1) to determine the recharge rate of LNAPL from the formation into the well; and 2) to attempt once again to determine the true product thickness in the formation. The test results are summarized in Table 1.

Baildown testing was performed in two different ways. In the case of wells 05-RW-1 and 05-RW-2, skimming tests were performed initially. The LNAPL in each well was

effectively bailed down during the skimming test. Following the test, the recovery of water and hydrocarbon were monitored over time.

The first recovery test was conducted at recovery well 1 (05-RW-1) because of its large original product thickness (2.00 ft). The test was conducted over three days. The objective was to gradually reduce the product thickness to a point where the recharge of the hydrocarbon in the well was equal to or greater than the extraction rate of the SOS system. If this could be achieved, it would be a clear indication that hydrocarbon recovery by this method is feasible.

The results of the skimming test at 05-RW-1 are presented in Figure 3. Over the three day test, we were not able to reduce the extraction rate low enough to match the recovery rate. Therefore, the product thickness continued to fall until it was essentially zero on the third day.

The SOS system was also tested at recovery well 2 (05-RW-2) and monitor well 10 (05-MW-10) with very similar results; the system reduced the product thickness to basically zero and then recovered what little product entered the well from the formation (Figures 4 and 5).

In the case of 09-MW-08, 05-MW-10, and 05-MW-04, the baildown test was performed first, which is the conventional method. Floating hydrocarbons and water were purged from the well using a Teflon bailer. The water and hydrocarbon levels in the well were then allowed to recovery over a 3 to 10 day period; water and product levels were monitored throughout the recovery period.

The results of the baildown tests are shown in Figure 5 through 7 and the center portion of Table 1. In Table 1, the "Time = 0 Thickness" is the product thickness immediately after baildown of the well. Also presented is the product thickness at elapsed times (1, 6, 24, 36, and 48 hours) following the baildown test. In parentheses is the percentage of the original product thickness (before the baildown test). After one hour, only one well showed a high rate of recharge; 05-MW-10 had recovered to 44% of its original product thickness. Therefore, 05-MW-

10 was considered a good candidate for hydrocarbon recovery testing using the SOS system. Conversely, 05-MW-04 did not recover any product 48 hours after its baildown. Although 09-MW-08 showed moderate recharge into the well, it was not a good candidate for recovery testing due to its isolation from an electrical source.

Unfortunately, we were never able to clearly observe the inflection point in any of the baildown/skimming tests. Possible explanations for the observed trends are as follows:

- For wells 05-RW-1 and 05-RW-2, the SOS skimming system did not recover LNAPL quickly enough to produce a distinctive drop in the product thickness; therefore, the water levels did not rise quickly in response to the product removal step.
- For the other wells, a rapid recharge of water levels occurred immediately following baildown without the characteristic gradual rise and fall normally observed; this is probably caused by recharge through the deeper portion of the well screens which are completed in the more permeable sand and gravel strata.
- For all wells, the water levels gradually declined throughout the static and recovery segments of the test; this reflects the normal regional decline of the water table post breakup of the Yukon River, and complicated analysis of the observed baildown results.
- Finally, the tenacious behavior of silty materials in the upper portion of the unconfined aquifer for free-phase product prevented adequate recharge of the wells; the LNAPLs were essentially bound within the pore spaces of the silty strata above the capillary fringe zone.

An alternate, conservative method for determining the formation thickness is outlined by Testa and Paczkowski (1989). Essentially, this method states that the actual formation thickness is the observed thickness multiplied by  $(1 - \text{specific gravity of the product})$ . The "Estimated Thickness" row in Table 1 was calculated using this method, assuming a LNAPL specific gravity of  $0.8 \text{ g/cm}^3$ . Values for estimated true product thickness ranged from 0.03 to 0.4 ft.

To predict the recovery rate of the SOS system, we used the baildown test product recovery results. As shown in Table 2, the product thickness in 05-RW-1 recovered 0.015 ft in six hours. For this 6-in. diameter well, this converts to a recharge rate of 0.005 gph, or 0.116 gal./day (42 gal./year), if operated continuously. Monitor well 05-MW-10 (2-in. diameter) had the highest rate of recovery (2 gal./day), and the highest relative volume (243% of amount initially present) of the five wells tested. However, there are several reasons why these recovery numbers may be inexact. First, this recovery rate may decrease over time as the product in the formation is reduced. Second, the system will not be operated continuously because it requires periodic maintenance and downtime. Finally, the recovery rates are likely to change in response to seasonal changes in water levels (i.e., recovery rates are expected to increase during fall and winter).

The results of the Phase III LNAPL recovery tests conducted in April 1994 are summarized in Tables F-3 and F-4. As anticipated, the lower water table during this portion of the year resulted in greater LNAPL thicknesses in the formation and higher product recovery rates. Product thicknesses of up to 2.72 ft were measured in POL area wells, with estimated formation thicknesses of up to 0.54 ft in well 05-W-2. Skimming tests conducted in well 05-RW-2, which had an estimated product thickness of 0.45 ft, succeeded in recovering 4.68 gallons of LNAPL in less than eight hours of operation. Although operational difficulties associated with ice formation complicated the 1994 skimming tests, the 1994 product recovery rate was more than five times that measured during July 1993 tests.

### **Conclusions**

Based on the baildown testing and hydrocarbon skimming tests that were performed at the Galena Airport, we offer the following conclusions:

- The maximum true product thickness observed in the POL area during the summer and fall is about 0.15 ft;

- The maximum true product thickness estimated in the summer 1993 was about 0.4 ft, based on an approximate method;
- The maximum true product thickness estimated in April 1994 was 0.54 ft.
- The SOS Recovery System is capable of recovering the product which is found in the upper silty or lower gravelly sand zones of the unconfined aquifer below the POL;
- During the April 1994 recovery testing, the system recovered much more product than the volume that was originally present in the well; and
- Implementation of an LNAPL recovery system at the POL is feasible.

### **Interpretation and Recommendations**

Baildown and skimming tests conducted during the fall 1992, summer 1993, and late winter 1994 on six groundwater wells in the POL and Million Gallon Hill areas detected a thin LNAPL layer in the silty aquifer increasing in thickness as the water table drops into the lower gravelly sand horizon during the winter months. The tests indicated that a product-only recovery system like the SOS system would be capable of removing the floating LNAPL layer, albeit at a slow rate during the summer months. Possible reasons that the recovery tests were not able to precisely define the product thicknesses were presented earlier.

Substantially different hydrologic conditions exist during low water table periods than during summer months. Baildown tests conducted during April 1994, when the LNAPL layer resides primarily in the gravelly sand layer indicate that a significant product thickness (greater than 0.50 ft) is present.

Skimming test conducted at this time succeeded in recovering more than four gallons of LNAPL from one well in less than eight hours; several times the recovery rate observed in earlier tests.

Detailed conclusions and recommendations are included in the *Treatability Study Final Report* (USAF/Radian, January 1995).

## References

USAF/Radian *Treatability Study Final Report*. January 1995

Testa, S.M. and M.T. Paczkowski. "Volume Determination and Recoverability of Free Hydrocarbon." *Ground Water Monitoring Review*. p. 120-128. Winter 1989.

Gruszczenski, T.S. "Determination of a Realistic Estimate of the Actual Formation Product Thickness Using Monitor Wells: A Field Bailout Test." In: *Proceedings of Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Detection, and Restoration*. NWWA, Houston, Texas. 1987.

**Table 1**

**Galena Hydrocarbon Recovery Summary**

Well ID	05-RW-1	05-RW-2	05-MW-04	05-MW-10	09-MW-08
<b>Initial Measurements</b>					
Original Product Level	13.73	13.48	13.42	15.63	18.68
Original Water Level	15.73	13.65	14.00	16.79	19.68
Original Product Thickness	2.00	0.17	0.58	1.16	1.00
Original Volume	2.94 gal.	0.25 gal	0.09 gal	0.19 gal	0.16 gal
<b>Recovery Results</b>					
Time = 0 Thickness	0.00	0.02	0.00	0.00	0.01
1 Hour Thickness	0.00 (0.0%)	0.02 (11.8%)	0.00 (0.0%)	0.50 (43.9%)	0.07 (7.0%)
6 Hour Thickness	0.02 (1.0%)	0.03 (17.6%)	0.01 (1.7%)	0.80 (69.0%)	0.15 (15.0%)
24 Hour Thickness	0.09 (4.5%)	0.03 (17.6%)	0.01 (1.7%)	0.85 (73.3%)	0.30 (30.0%)
30 Hour Thickness	0.10 (5.0%)	0.03 (17.6%)	0.00 (0.0%)	0.92 (79.3%)	0.30 (30.0%)
48 Hour Thickness	0.25 (12.5%)	0.01 (5.9%)	0.00 (0.0%)	0.91 (78.4%)	0.32 (32.0%)
Estimated Formation Thickness	0.40	0.03	0.12	0.23	0.20
<b>Skimming Results</b>					
Well Skimmed?	Yes	Yes	No	Yes	No
Recovered Volume	5.23 gal (178%)	0.16 gal (64%)	--	0.46 gal (243%)	--

Note: All results in feet.



**Table 2**

**Estimated Hydrocarbon Recovery Rates**

Well ID	05-RW-1	05-RW-2	05-MW-10
Hourly Recovery (gph)	0.005	0.002	0.08
Daily Recovery (gpd)	0.116	0.06	2.0
Yearly Recovery (gpy)	42	21	715

**Table F-3**  
**Phase III LNAPL Thickness Survey (Winter 1994)**

Date	Time	Well ID	Product Depth (ft)	Water Depth (ft)	Product Thickness (ft)	Comments
4/13/94	1500	05-MW-04	27.7	30.08	2.38	
4/13/94	1512	05-MW-03	30.24	30.85	0.61	
4/13/94	1530	05-MW-02	No product	32.01	0	
4/13/94	1547	05-MW-37	No product	No water	0	Dry well 28.50 depth to bottom
4/13/94	1620	05-MW-05	27.69	27.69	Sheen	Sheen
4/13/94	1640	05-MW-01	27.86	30.19	2.33	
4/13/94	1655	05-MW-10	28.88	No water	1.52	30.40 depth to bottom
4/13/94	1705	W-5	No product	33.03	0	Treatability study well
4/13/94	1710	05-MW-01	28.41	29.64	1.23	29.9 depth to bottom
4/13/94	1730	05-MW-08	No product	27.93	0	
4/13/94	1740	05-MW-09	No product	No water	0	28.3 depth to bottom
4/13/94	1745	05-MW-11	No product	No water	0	27.6 depth to bottom
4/13/94	1800	05-MW-13	No product	No water	0	27.6 depth to bottom
4/13/94	1805	05-MW-12	No product	No water	0	24.9 depth to bottom
4/13/94	1815	KV-1	No product	No water	0	23.4 depth to bottom
4/13/94	1820	KV-6	No product	27.95	0	
4/13/94	1828	6" Pump Well	No product	26.71	0	
4/13/94	1830	KV-2	No product	27.13	0	
4/13/94	1835	KV-4	No product	27.84	0	
4/13/94	1840	KV-3	No product	22.84	0	23.10 depth to bottom
4/13/94	1845	05-MW-06	No product	27.38	0	Has a transducer in it
4/13/94	1850	KV-5	No product	28	0	
4/14/94	1750	05-MW-15	--	--	--	Could not open, well cap damaged
4/14/94	1800	05-MW-14	--	--	--	Could not locate, covered by 2 in. of ice
4/14/94	1820	05-MW-38	--	--	--	Could not locate under 2 ft of snow
4/14/94	1820	05-MW-39	--	--	--	Could not locate under 2 ft of snow
4/16/94	845	05-MW-07	30.33	31.14	0.81	

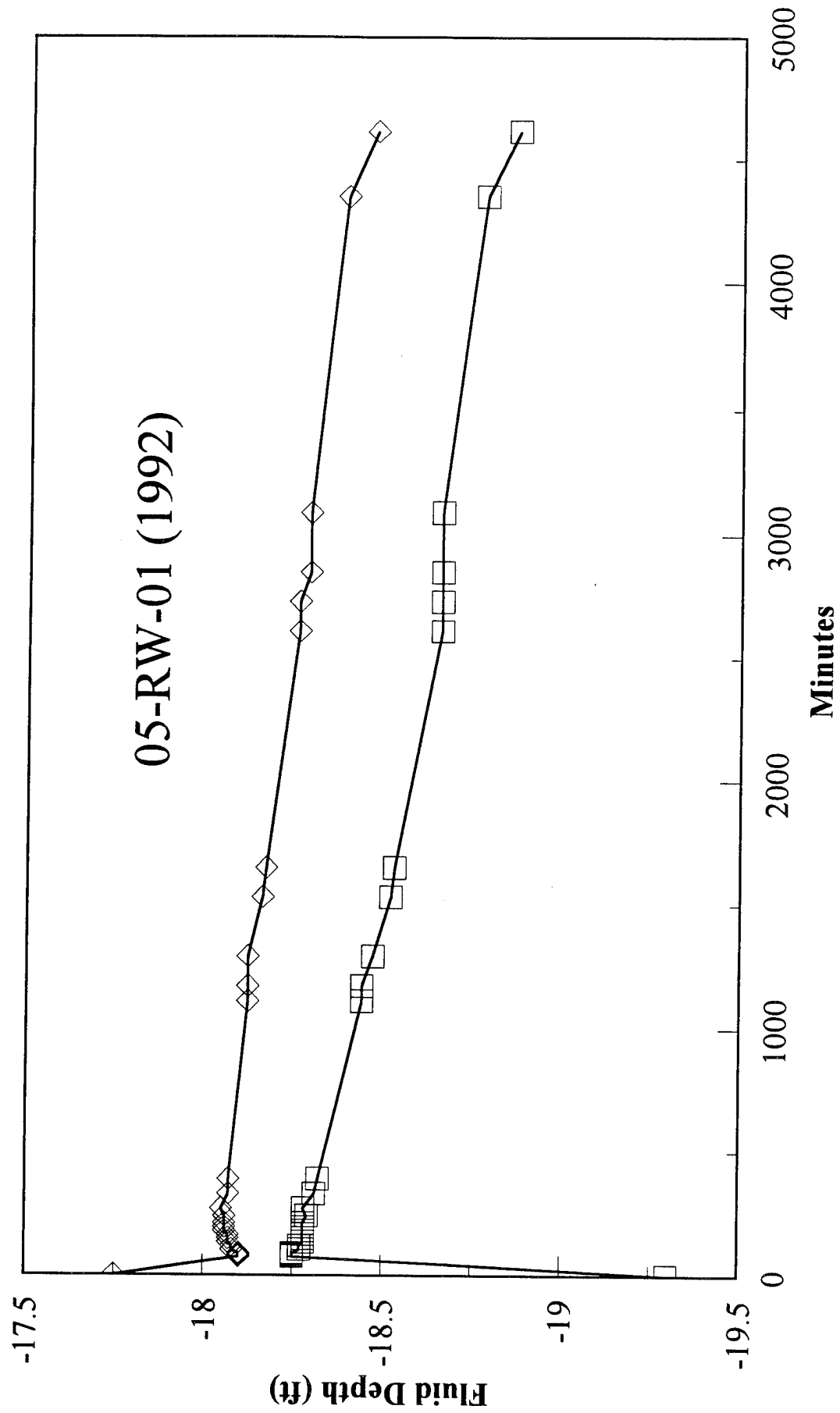
**Table F-4**  
**Phase III Hydrocarbon Recovery Summary (Winter 1994)**

Well ID	05-MW-04	05-RW-2	05-W-2	05-MW-07	06-MW-04
<b>Initial Measurements</b>					
Original Product Level	27.77	27.93	28.42	30.33	25.09
Original Water Level	30.20	30.20	31.14	30.93	26.93
Original Product Thickness	2.43	2.27	2.72	0.60	1.84
Original Volume (gal.)	0.39	3.33	0.43	0.10	0.29
<b>Recovery Results</b>					
Time = 0 Thickness	0.15	0.41	0.92	0.00	0.11
1-Hour Thickness	0.66 (27.2%)	1.04 (45.8%)	2.50 (91.9%)	0.02 (3.3%)	0.97 (52.7%)
6-Hour Thickness	1.88 (77.4%)	1.68 (74.0%)	2.52 (92.6%)	0.07 (11.7%)	1.14 (62.0%)
12-Hour Thickness	2.23 (91.8%)	1.92 (84.6%)	2.4 (88.2%)	0.2 (33.3%)	Not measured
30-Hour Thickness	Not measured	2.00 (88.1%)	Not measured	Not measured	Not measured
48-Hour Thickness	Not measured	2.18 (96.0%)	Not measured	Not measured	Not measured
Estimated Formation Thickness	0.49	0.45	0.54	0.16	0.37
<b>Skimming Results</b>					
Well Skimmed?	No	Yes	No	No	No
Recovered Volume (gal.)	---	4.68 (141%)	---	---	---

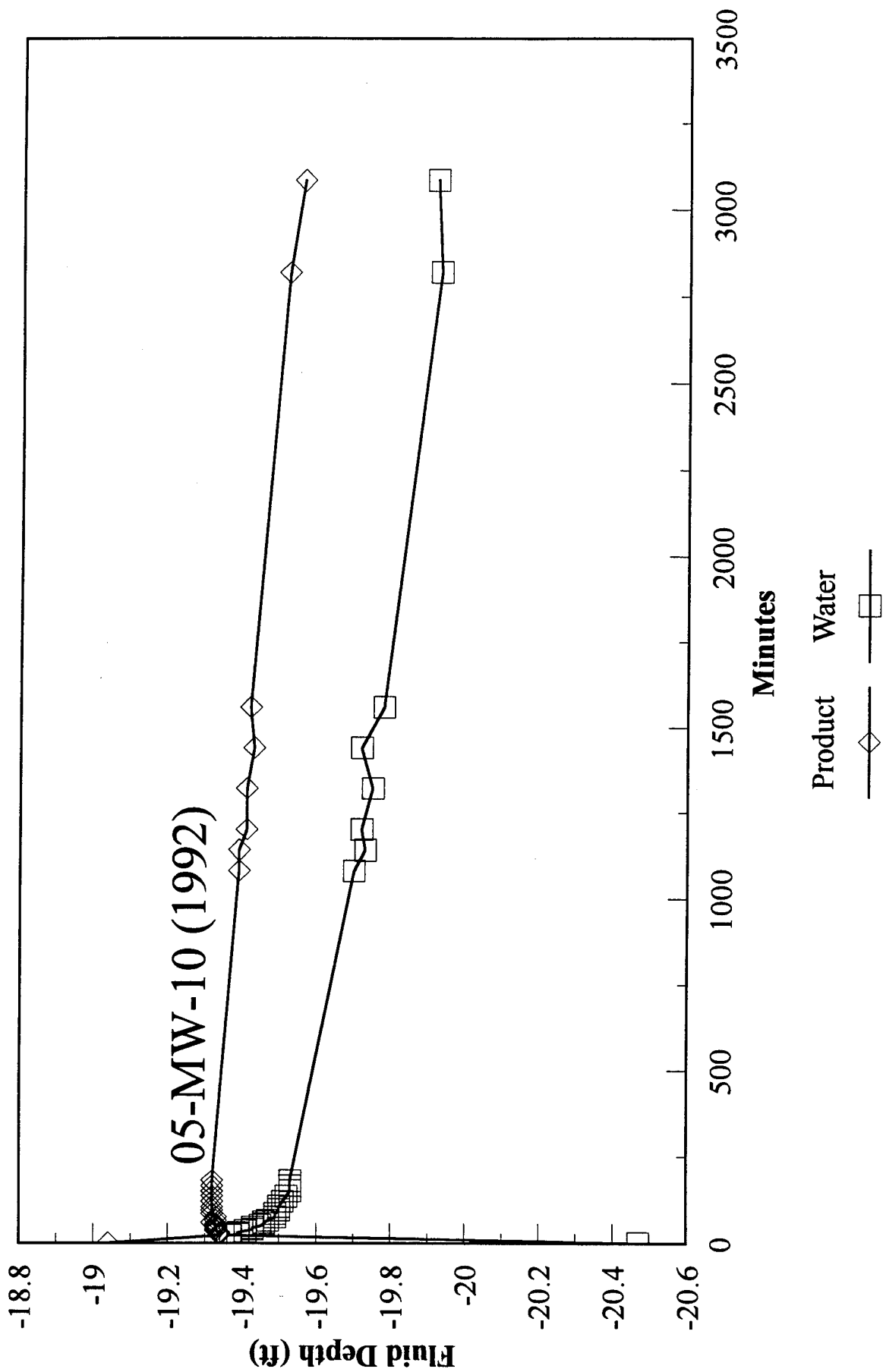
Note: All results in feet unless noted otherwise"

**Figure 1**

Baildown Test

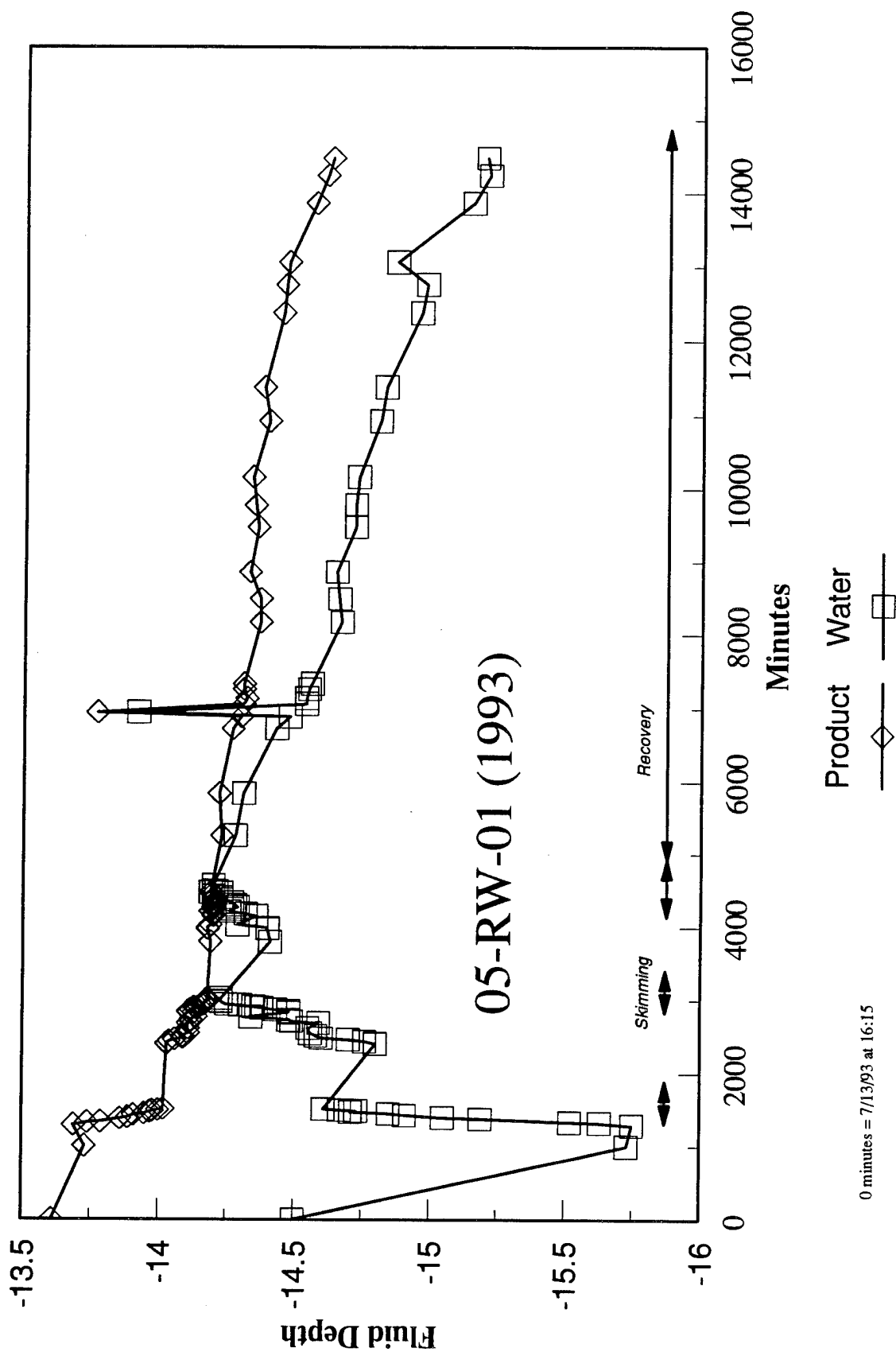


**Figure 2**  
Baildown Test

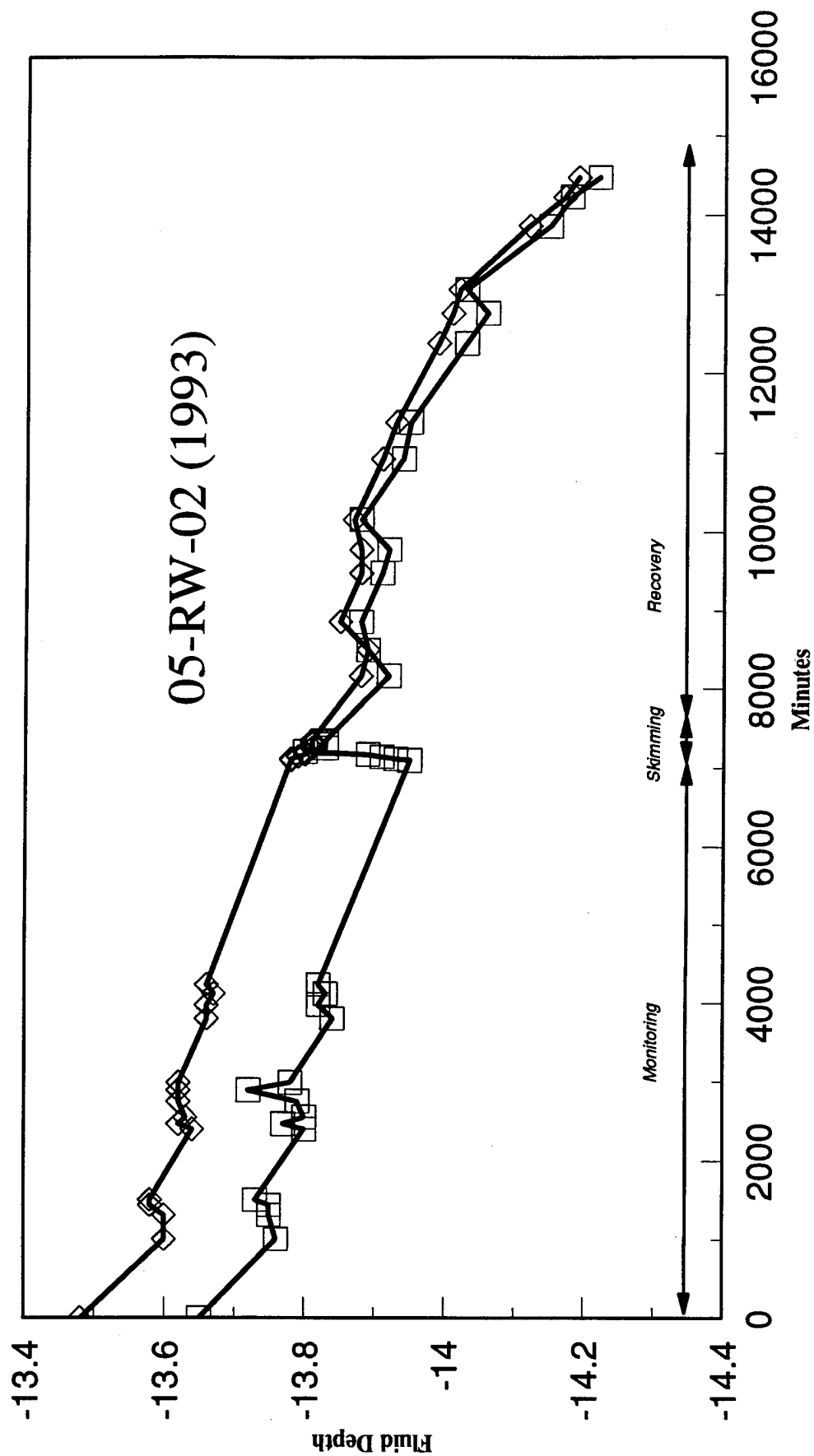


# Figure 3

## Baildown Testing and Skimming Results

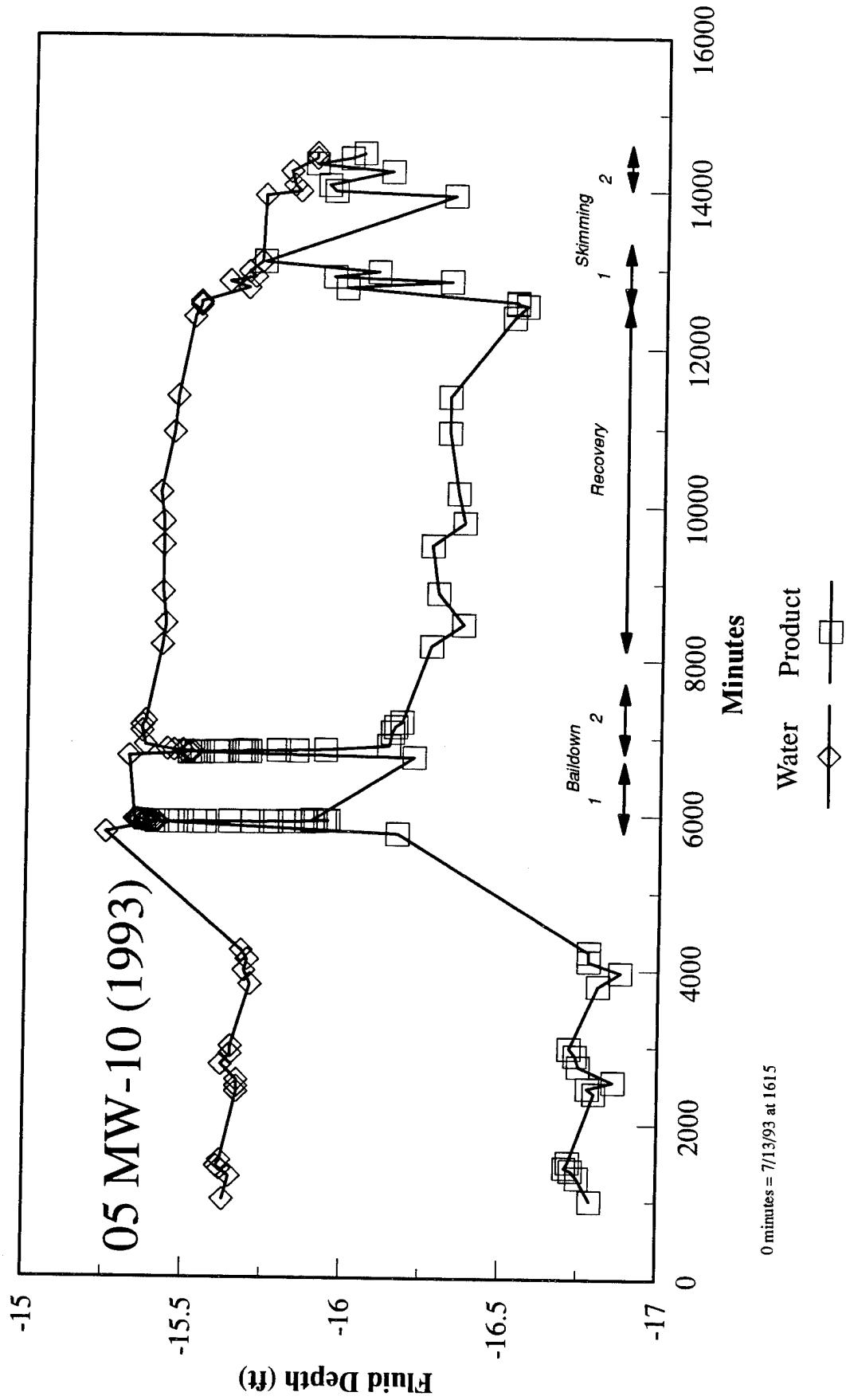


**Figure 4**  
Baildown Testing and Skimming Results



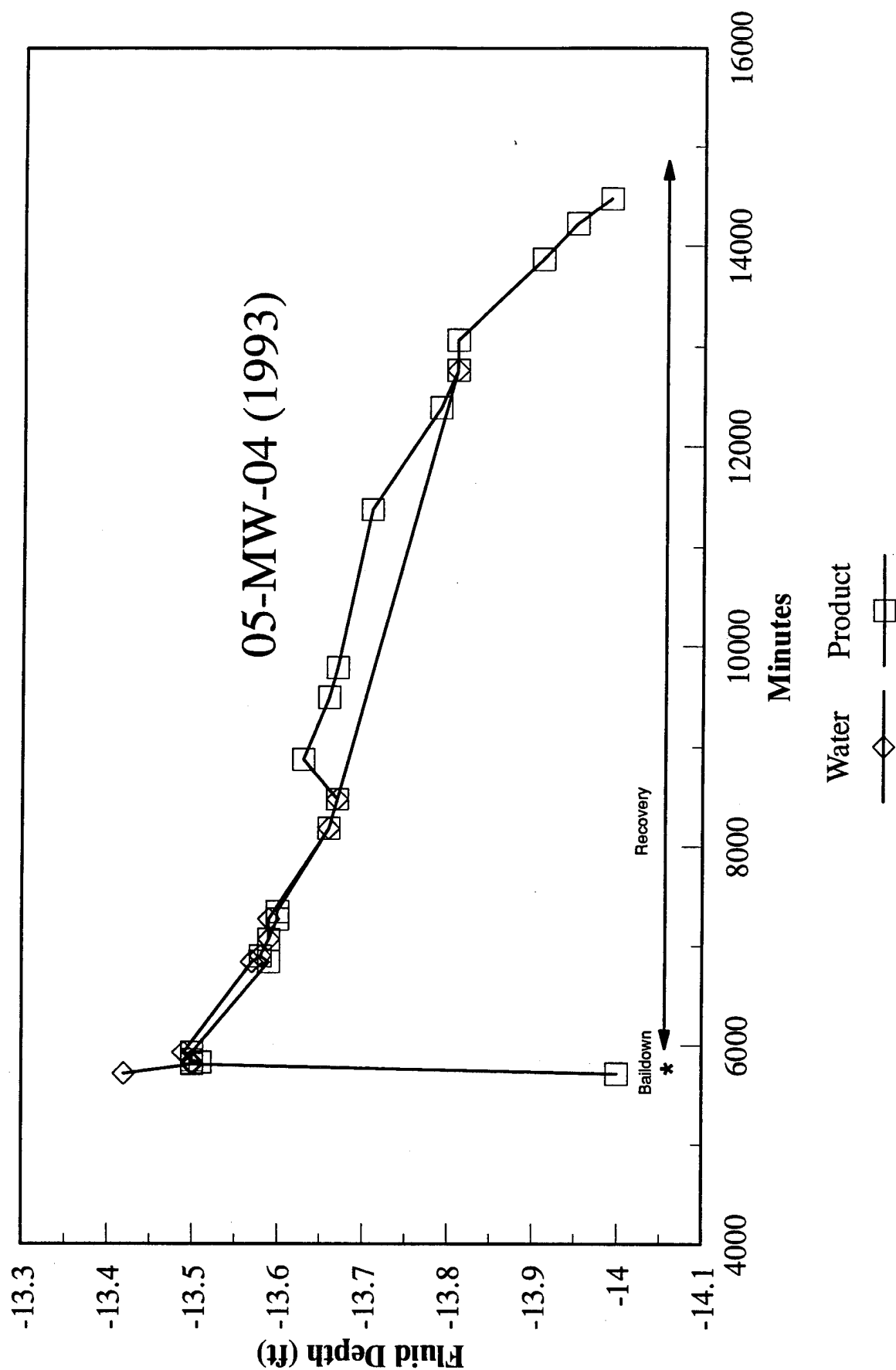
0 minutes = 7/13/93 at 1615

**Figure 5**  
Baildown Testing and Skimming Results



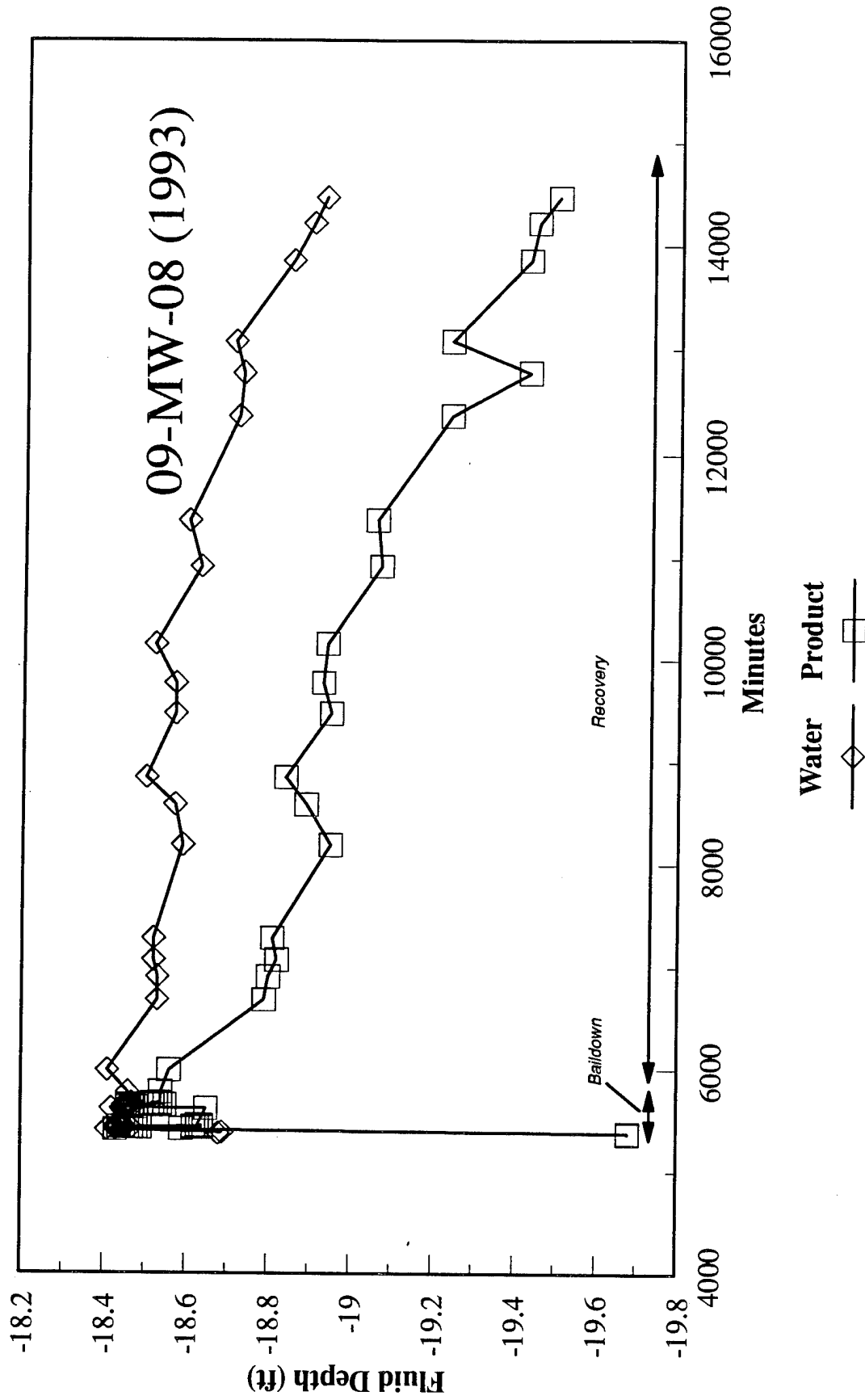


**Figure 6**  
Baildown Testing and Skimming Results



# Figure 7

Baildown Testing and Skimming Results



**GALENA AFS**  
**HYDROCARBON RECOVERY TESTING**  
**05-RW-1**



### Baildown Test: Hydrocarbon Recovery Well

Date	Time	Elapsed Time (min)	Product Level (feet)	Water Level (feet)	Product Thickness (feet)
09/17/92	13:00	0	17.75	19.3	1.55
09/17/92	14:15	76	18.1	18.25	0.15
09/17/92	14:19	80	18.1	18.25	
09/17/92	14:24	85	18.1	18.25	
09/17/92	14:30	90	18.1	18.25	
09/17/92	14:44	105	18.08	18.27	0.19
09/17/92	15:00	120	18.08	18.27	
09/17/92	15:15	135	18.07	18.28	0.21
09/17/92	15:29	150	18.07	18.28	
09/17/92	15:45	165	18.07	18.28	
09/17/92	16:00	180	18.06	18.28	0.22
09/17/92	16:14	195	18.06	18.28	
09/17/92	16:30	210	18.06	18.28	
09/17/92	16:59	240	18.06	18.29	0.23
09/17/92	17:30	270	18.05	18.28	
09/17/92	18:30	330	18.07	18.31	0.24
09/17/92	19:30	390	18.07	18.32	
09/18/92	07:30	1110	18.12	18.44	0.32
09/18/92	08:30	1170	18.12	18.44	
09/18/92	10:30	1290	18.12	18.47	0.35
09/18/92	14:30	1530	18.16	18.52	0.36
09/18/92	16:30	1650	18.17	18.53	
09/19/92	08:30	2610	18.26	18.66	0.4
09/19/92	10:30	2730	18.26	18.66	
09/19/92	12:29	2850	18.29	18.66	
09/19/92	16:30	3090	18.29	18.66	
09/20/92	13:30	4350	18.39	18.78	
09/20/92	17:55	4615	18.47	18.87	

Site 5 Recovery Well 1						
Date	Time	Baseline	Product Height	Water Height	Product Thickness	Pump
13-Jul-93	1620	5	-13.61	-14.5	0.89	
14-Jul-93	900	1005	-13.73	-15.73	2.00	
	Began Skimming					
	1346	1291	-13.69	-15.75	2.06	On
	1419	1324	-13.74	-15.63	1.89	2
	1432	1337	-13.79	-15.52	1.73	Off
	1515	1380	-13.86	-15.19	1.33	0
	1530	1395	-13.89	-15.05	1.16	
	1603	1428	-13.91	-14.91	1.00	1
	1625	1450	-13.95	-14.85	0.90	
	1647	1472	-13.97	-14.71	0.74	
	1701	1486	-13.98	-14.73	0.75	
	1714	1499	-14	-14.67	0.67	
	1728	1513	-14.02	-14.61	0.59	
15-Jul-93	815	2400	-14.03	-14.8	0.77	
	Began Skimming					
	820	2405	-14.03	-14.8	0.77	1
	851	2436	-14.04	-14.76	0.72	1
	916	2461	-14.06	-14.7	0.64	
	934	2479	-14.09	-14.6	0.51	
	1005	2510	-14.09	-14.58	0.49	
	1042	2547	-14.11	-14.56	0.45	
	1150	2615	-14.11	-14.55	0.44	
	1300	2685	-14.11	-14.59	0.48	
	1326	2711	-14.12	-14.49	0.37	
	1343	2728	-14.12	-14.48	0.36	
	1425	2770	-14.14	-14.34	0.20	
	1520	2825	-14.13	-14.48	0.35	
	1530	2835	-14.11	-14.48	0.37	
	1540	2845	-14.11	-14.48	0.37	
	1600	2865	-14.12	-14.43	0.31	
	1622	2887	-14.14	-14.38	0.24	
	1631	2896	-14.13	-14.36	0.23	
	1642	2907	-14.15	-14.35	0.20	
	1703	2928	-14.16	-14.3	0.14	
	1716	2941	-14.17	-14.25	0.08	
	1746	2971	-14.17	-14.23	0.06	
	1758	2983	-14.18	-14.23	0.05	
						Skimmer Lowered at 1104 Compressor Motor Overheating
						Compressor Motor Overheating

16-Jul-93	1835	3020	-14.18	-14.23	0.05		
	730	3795	-14.19	-14.41	0.22		
	1025	3970	-14.18	-14.4	0.22		
	Began Skimming						
	1038	3983	-14.18	-14.4	0.22	1.5	180
	1120	4025	-14.19	-14.29	0.10		
	1322	4147	-14.2	-14.36	0.16		
	1352	4177	-14.2	-14.32	0.12		
	1423	4208	-14.19	-14.26	0.07	1.5	135
	1452	4237	-14.2	-14.27	0.07		
	1521	4266	-14.2	-14.29	0.09		
	1551	4296	-14.2	-14.28	0.08		
	1622	4327	-14.2	-14.27	0.07		
	1705	4370	-14.2	-14.23	0.03		
	1731	4396	-14.2	-14.23	0.03		
	1800	4425			0.00	5	30
	1835	4460	-14.2	-14.23	0.03		
	1845	4470	-14.19	-14.19	0.00		
	Begin Baildown Test						
	1853	4478	-14.21	-14.21	0.00		
	1854	4479	-14.2	-14.2	0.00		
	1855	4480	-14.2	-14.2	0.00		
	1857	4482	-14.21	-14.21	0.00		
	1858	4483	-14.21	-14.21	0.00		
	1859	4484	-14.2	-14.2	0.00		
	1900	4485	-14.2	-14.2	0.00		
	1901	4486	-14.2	-14.2	0.00		
	1902	4487	-14.2	-14.2	0.00		
	1903	4488	-14.2	-14.2	0.00		
	2023	4568	-14.2	-14.2	0.00		
17-Jul-93	743	5248	-14.23	-14.28	0.00		
	1729	5834	-14.22	-14.31	0.05		
					0.09		
18-Jul-93	820	6725	-14.27	-14.43	0.16		
	1103	6888	-14.3	-14.48	0.18		
	1155	6940	-13.77	-13.92	0.15		
	1353	7058	-14.31	-14.54	0.23		
	1510	7135	-14.32	-14.54	0.22		
	1713	7258	-14.31	-14.55	0.24		
	1825	7330	-14.31	-14.56	0.25		
19-Jul-93	825	8170	-14.37	-14.67	0.30		

20-Jul-93	1345	8490	-14.37	-14.66	0.29	
	1955	8860	-14.33	-14.65	0.32	
21-Jul-93	618	9483	-14.36	-14.72	0.36	
	1118	9783	-14.35	-14.72	0.37	
	1738	10163	-14.34	-14.73	0.39	
22-Jul-93	622	10927	-14.4	-14.81	0.41	
	1400	11385	-14.38	-14.83	0.45	
23-Jul-93	637	12382	-14.45	-14.96	0.51	
	1257	12762	-14.46	-14.98	0.52	
	1800	13065	-14.47	-14.87	0.40	
23-Jul-93	721	13866	-14.57	-15.15	0.58	
	1340	14245	-14.61	-15.21	0.60	
	1737	14482	-14.63	-15.2	0.57	



**GALENA AFS**  
**HYDROCARBON RECOVERY TESTING**  
**05-RW-2**



Site 5 Recovery Well 2

Date	Time (Baseline)	Prod. Ht.	Water Ht.	Prod. Th.	Pump	Comments
13-Jul-93	1615	0	-13.48	-13.65	0.17	
14-Jul-93	900	1005	-13.6	-13.76	0.16	
	1407	1312	-13.6	-13.75	0.15	
	1615	1440	-13.58	-13.75	0.17	
	1720	1505	-13.58	-13.73	0.15	
15-Jul-93	815	2400	-13.64	-13.8	0.16	
	922	2467	-13.62	-13.77	0.15	
	1045	2550	-13.63	-13.8	0.17	
	1405	2750	-13.62	-13.79	0.17	
	1625	2890	-13.62	-13.72	0.10	
	1800	2985	-13.62	-13.78	0.16	
16-Jul-93	730	3795	-13.66	-13.84	0.18	
	1025	3970	-13.66	-13.82	0.16	
	1248	4113	-13.67	-13.83	0.16	
	1445	4230	-13.66	-13.82	0.16	
Begin Skimming						
18-Jul-93	1435	7100	-13.78	-13.95	0.17	On 1 Off 120
	1450	7115	-13.78	-13.93	0.15	
	1515	7140	-13.79	-13.91	0.12	
	1545	7170	-13.8	-13.89	0.09	
	1620	7205	-13.8	-13.8	0.00	1 195
	1705	7250	-13.81	-13.83	0.02	2 90
	1756	7301	-13.81	-13.83	0.02	
	1820	7325	-13.81	-13.83	0.02	2 75
	1840	7345	-13.81	-13.83	0.02	1 60
Began Baildown						
19-Jul-93	821	8166	-13.88	-13.92	0.04	
	1350	8495	-13.89	-13.89	0.00	
	1950	8855	-13.85	-13.88	0.03	

Site 5 Recovery Well 2

Date	Time (Baseline)	Prod. Ht.	Water Ht.	Prod. Th.	Pump	Comments
20-Jul-93	615	9480	-13.88	-13.91	0.03	
	1115	9780	-13.88	-13.92	0.04	
	1735	10160	-13.87	-13.88	0.01	
21-Jul-93	620	10925	-13.91	-13.94	0.03	
	1357	11382	-13.93	-13.95	0.02	
22-Jul-93	635	12380	-13.99	-14.03	0.04	
	1255	12760	-14.01	-14.06	0.05	
	1755	13060	-14.02	-14.03	0.01	
23-Jul-93	718	13863	-14.12	-14.15	0.03	
	1329	14234	-14.17	-14.18	0.01	
	1734	14479	-14.19	-14.22	0.03	

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**HYDROCARBON RECOVERY TESTING**  
**05-MW-04**



# Site 5 Monitoring Well 4

Comments

Pump

Prod. Th.

Water Ht.

Prod. Ht.

(Baseline)

Time

Date

0.58

-14

-13.42

5715

1530

17-Jul-93

Begin Baildown

0.00

-13.5

-13.5

5806

1701

0.00

-13.5

-13.5

5807

1702

0.00

-13.5

-13.5

5808

1703

0.00

-13.5

-13.5

5810

1705

0.00

-13.5

-13.5

5813

1708

0.01

-13.5

-13.5

5816

1711

0.01

-13.51

-13.5

5824

1719

0.01

-13.51

-13.5

5830

1725

0.01

-13.5

-13.5

5849

1744

0.01

-13.5

-13.49

5926

1901

0.02

-13.59

-13.57

6839

1014

0.00

-13.58

-13.58

6895

1110

0.00

-13.59

-13.59

7063

1358

0.01

-13.60

-13.59

7265

1720

0.01

-13.60

-13.60

7340

1835

0.00

-13.66

-13.66

8180

835

0.00

-13.67

-13.67

8475

1330

0.00

-13.63

-13.63

8875

2010

0.00

-13.66

-13.66

9490

625

0.00

-13.67

-13.67

9788

1123

0.00

-13.98

-13.98

10170

1745

0.00

-14.70

-14.70

10935

630

0.00

-13.71

-13.71

11374

1349

0.00

-13.79

-13.81

12390

645

0.00

-13.81

-13.81

12766

1301

0.00

-13.81

-13.81

13068

1803

22-Jul-93

Site 5 Monitoring Well 4						
Date	Time	(Baseline)	Prod. Ht.	Water Ht.	Prod. Th.	Pump
23-Jul-93	724	13869		-13.91		
	1320	14225		-13.95		
	1730	14475		-13.99		



**GALENA AFS**  
**HYDROCARBON RECOVERY TESTING**  
**05-MW-10**



### Baildown Test: 05-MW-10

Date	Time	Elapsed Time (min)	Product Level (feet)	Water Level (feet)	Product Thickness (feet)
09/18/92	14:30	0	19.04	20.47	1.43
09/18/92	14:53	23	19.34	19.37	0.03
09/18/92	14:55	25	19.34	19.39	
09/18/92	14:57	28	19.34	19.39	
09/18/92	15:00	30	19.34	19.39	
09/18/92	15:04	35	19.33	19.41	
09/18/92	15:09	40	19.33	19.43	0.1
09/18/92	15:15	45	19.33	19.43	
09/18/92	15:20	50	19.33	19.45	
09/18/92	15:24	55	19.33	19.46	
09/18/92	15:29	60	19.32	19.46	
09/18/92	15:35	65	19.33	19.47	
09/18/92	15:45	75	19.33	19.49	
09/18/92	15:54	85	19.32	19.49	
09/18/92	16:05	95	19.32	19.5	
09/18/92	16:14	105	19.32	19.5	
09/18/92	16:30	120	19.32	19.51	
09/18/92	16:45	135	19.32	19.52	0.2
09/18/92	16:59	150	19.32	19.53	
09/18/92	17:15	165	19.32	19.53	
09/18/92	17:30	180	19.32	19.53	
09/19/92	08:30	1080	19.39	19.7	0.31
09/19/92	09:29	1140	19.39	19.73	
09/19/92	10:30	1200	19.41	19.72	
09/19/92	12:29	1320	19.41	19.75	
09/19/92	14:30	1440	19.43	19.72	
09/19/92	16:30	1560	19.42	19.78	
09/20/92	13:30	2820	19.52	19.93	0.41
09/20/92	17:55	3085	19.56	19.92	

Site 5 Monitoring Well 10

Date	Time (Baseline)	Prod. Ht.	Water Ht.	Prod. Th.	Pump	Comments
14-Jul-93	900	1005	-15.63	-16.79	1.16	
	1403	1308	-15.65	-16.75	1.10	
	1535	1400	-15.62	-16.73	1.11	
	1611	1436	-15.61	-16.71	1.10	
	1725	1510	-15.62	-16.72	1.10	
15-Jul-93	815	2400	-15.67	-16.8	1.13	
	922	2467	-15.67	-16.78	1.11	
	1045	2550	-15.67	-16.86	1.19	
	1405	2750	-15.62	-16.75	1.13	
	1625	2890	-15.65	-16.74	1.09	
	1800	2985	-15.65	-16.72	1.07	
16-Jul-93	730	3795	-15.71	-16.81	1.10	
	1025	3970	-15.69	-16.88	1.19	
	1250	4115	-15.7	-16.78	1.08	
	1450	4235	-15.68	-16.78	1.10	
17-Jul-93	1605	5750	-15.25	-16.17	0.92	
Begin Baildown						
	1821	5886	-15.41	-15.41	0.00	
	1823	5887.5	-15.41	-15.44	0.03	
	1823	5888	-15.41	-15.47	0.06	
	1824	5889	-15.4	-15.53	0.13	
	1825	5890	-15.41	-15.56	0.15	
	1828	5892.5	-15.39	-15.64	0.25	
	1830	5894.5	-15.38	-15.71	0.33	
	1831	5896	-15.38	-15.77	0.39	
	1834	5899	-15.37	-15.83	0.46	
	1836	5901	-15.38	-15.88	0.50	
	1840	5905	-15.37	-15.9	0.53	
	1844	5908.5	-15.36	-15.91	0.55	
	1846	5911	-15.35	-15.95	0.60	
	1849	5914	-15.35	-15.94	0.59	

# Site 5 Monitoring Well 10

Date	Time (Baseline)	Prod. Ht.	Water Ht.	Prod. Th.	Pump	Comments
1852	5917	-15.34	-15.95	0.61		
1855	5920	-15.34	-15.9	0.56		
18-Jul-93	830	6735	-16.22	0.90		
Repeat Baildown						
915	6780	-15.51	-15.51	0.00		
916	6781	-15.51	-15.51	0.00		
916.5	6781.5	-15.51	-15.51	0.00		
917	6782	-15.51	-15.52	0.01		
917.5	6782.5	-15.51	-15.51	0.00		
918	6783	-15.51	-15.52	0.01		
918.5	6783.5	-15.51	-15.51	0.00		
919	6784	-15.51	-15.51	0.00		
919.5	6784.5	-15.51	-15.52	0.01		
920	6785	-15.51	-15.52	0.01		
921	6786	-15.51	-15.55	0.04		
922	6787	-15.51	-15.53	0.02		
923	6788	-15.51	-15.53	0.02		
924	6789	-15.51	-15.6	0.09		
925	6790	-15.51	-15.6	0.09		
927	6792	-15.52	-15.61	0.09		
929	6794	-15.51	-15.67	0.16		
931	6796	-15.52	-15.69	0.17		
933	6798	-15.52	-15.7	0.18		
935	6800	-15.52	-15.68	0.16		
940	6805	-15.49	-15.69	0.20		
945	6810	-15.49	-15.85	0.36		
950	6815	-15.46	-15.79	0.33		
1000	6825	-15.44	-15.94	0.50		
1058	6883	-15.37	-16.14	0.77		
1350	7055	-15.36	-16.15	0.79		
1504	7129	-15.36	-16.16	0.80		
1600	7185	-15.37	-16.18	0.81		

Site 5 Monitoring Well 10

Date	Time (Baseline)	Prod. Ht.	Water Ht.	Prod. Th.	Pump	Comments
19-Jul-93	827	8172	-15.42	-16.27	0.85	
	1310	8455	-15.43	-16.37	0.94	
	2000	8865	-15.42	-16.29	0.87	
20-Jul-93	620	9485	-15.42	-16.27	0.85	
	1120	9785	-15.42	-16.37	0.95	
	1740	10165	-15.41	-16.35	0.94	
21-Jul-93	626	10931	-15.45	-16.32	0.87	
	1402	11387	-15.46	-16.32	0.86	
22-Jul-93	640	12385	-15.51	-16.52	1.01	
	905	12530	-15.53	-16.56	1.03	
	935	12560	-15.53	-16.53	1.00	
Begin Skimming						
	950	12575	-15.53	-16.53	1.00	On 90
	1015	12600			1	135
	1245	12750	-15.68	-15.99	0.31	
	1305	12770			1	165
	1410	12835	-15.62	-16.32	0.70	1.5 135
	1505	12890	-15.7	-15.95	0.25	1.5 165
	1610	12955	-15.68	-16.09	0.41	1.5 135
	1820	13085	-15.72	-15.73	0.01	
	830	13935	-15.73	-16.33	0.60	1.5 150
	930	13995	-15.84	-15.95	0.11	1.5 165
	1045	14070	-15.82	-15.93	0.11	
	1345	14250	-15.81	-16.13	0.32	
23-Jul-93	1520	14345	-15.89	-15.89		
	1635	14420	-15.89	-16	0.11	
	1740	14485	-15.89	-16.04	0.15	

**GALENA AFS**  
**HYDROCARBON RECOVERY TESTING**  
**09-MW-08**





Well ID: 09-MW-08

Date	Time	(Baseline)	Prod. Ht.	Water Ht.	Prod. Th.	Pump	Comment
17-Jul-93	945	5370	-18.68	-19.68	1.00		
Begin Baildown							
	955	5380	-18.69	-19.68	0.99		
	1020	5405	-18.41	-18.43	0.02		
	1027	5412	-18.43	-18.59	0.16		
	1035.5	5420.5	-18.47	-18.49	0.02		
	1036	5421	-18.45	-18.48	0.03		
	1036.5	5421.5	-18.44	-18.62	0.18		
	1037	5422	-18.45	-18.47	0.02		
	1037.5	5422.5	-18.45	-18.46	0.01		
	1038	5423	-18.44	-18.47	0.03		
	1038.5	5423.5	-18.45	-18.47	0.02		
	1039	5424	-18.45	-18.62	0.17		
	1039.5	5424.5	-18.45	-18.64	0.19		
	1040	5425	-18.45	-18.63	0.18		
	1040.5	5425.5	-18.44	-18.64	0.20		
	1041	5426	-18.44	-18.63	0.19		
	1041.5	5426.5	-18.43	-18.64	0.21		
	1042	5427	-18.44	-18.64	0.20		
	1043	5428	-18.45	-18.46	0.01		
	1044	5429	-18.44	-18.48	0.04		
	1045	5430	-18.45	-18.63	0.18		
	1046	5431	-18.43	-18.44	0.01		
	1047	5432	-18.44	-18.45	0.01		
	1048	5433	-18.45	-18.62	0.17		
	1050	5435	-18.44	-18.62	0.18		
	1051	5436	-18.45	-18.62	0.17		
	1052	5437	-18.45	-18.63	0.18		
	1053	5438	-18.45	-18.64	0.19		
	1054	5439	-18.45	-18.63	0.18		
	1056	5441	-18.45	-18.64	0.19		
	1058	5443	-18.46	-18.63	0.17		
	1100	5445	-18.44	-18.64	0.20		
	1102	5447	-18.45	-18.64	0.19		

Date	Time	(Baseline)	Prod. Ht.	Water Ht.	Prod. Th.	Pump	Comment
18-Jul-93	1104	5449	-18.45	-18.63	0.18		
	1346	5611	-18.42	-18.65	0.23		
	1353.5	5618.5	-18.47	-18.48	0.01		
	1354	5619	-18.46	-18.47	0.01		
	1354.5	5619.5	-18.46	-18.47	0.01		
	1355	5620	-18.46	-18.47	0.01		
	1356	5621	-18.45	-18.46	0.01		
	1357	5622	-18.46	-18.47	0.01		
	1358	5623	-18.45	-18.46	0.01		
	1359	5624	-18.46	-18.47	0.01		
	1400	5625	-18.45	-18.46	0.01		
	1405	5630	-18.46	-18.47	0.01		
	1414	5639	-18.45	-18.52	0.07		
	1416.5	5641.5	-18.46	-18.52	0.06		
	1419	5644	-18.45	-18.46	0.01		
	1421	5646	-18.47	-18.55	0.08		
	1425	5650	-18.46	-18.51	0.05		
	1428	5653	-18.46	-18.53	0.07		
	1432	5657	-18.47	-18.54	0.07		
	1436	5661	-18.46	-18.52	0.06		
	1440	5665	-18.47	-18.54	0.07		
	1625	5770	-18.46	-18.54	0.08		
	2000	5985	-18.41	-18.56	0.15		
	733	6678	-18.53	-18.79	0.26		
	1119	6904	-18.53	-18.8	0.27		
	1405	7070	-18.52	-18.82	0.30		
	1735	7280	-18.52	-18.81	0.29		
19-Jul-93							
	841	8186	-18.59	-18.95	0.36		
	1515	8580	-18.57	-18.89	0.32		
	1940	8845	-18.5	-18.84	0.31		

Retry Baildown

Well ID: 09-MW-08

Date	Time	(Baseline)	Prod. Ht.	Water Ht.	Prod. Th.	Pump	Comment
20-Jul-93	605	9470	-18.57	-18.95	0.38		
	1105	9770	-18.57	-18.93	0.36		
	1730	10155	-18.52	-18.94	0.42		
21-Jul-93	615	10920	-18.63	-19.07	0.44		
	1349	11374	-18.6	-19.06	0.46		
22-Jul-93	625	12370	-18.72	-19.24	0.52		
	1311	12776	-18.73	-19.43	0.70		
	1812	13077	-18.71	-19.24	0.53		
23-Jul-93	710	13855	-18.85	-19.43	0.58		
	1315	14220	-18.9	-19.45	0.55		
	1725	14470	-18.93	-19.5	0.57		



**Results of Analysis for Free Product  
from the POL Tank Farm**



**MEMORANDUM**

TO: Mike McGhee, AFCEE/ESR

FROM: Mike Green

DATE: May 31, 1994

COPY: Wes Lannen, 11CEOS/CEVR

**SUBJECT: Galena Airport - Analysis of Recovered Hydrocarbons**

Please find the attached table of analytical results for a liquid sample collected from a drum of free-phase product which is currently being stored in the current Waste Accumulation Area (Bldg. 1488) at Galena Airport. This sample was collected and analyzed according to the instructions of Wes Lannen. The waste drum contains fluids recovered during baildown and skimming tests conducted during July, 1993 and April, 1994. The analyte list was selected by the 11CEOS.





## Waste Drum Results (Sampled 4-19-94)

Analyte	TCLP Limit	Concentration/dl	
TCLP VOC's (mg/L)			
Benzene	0.5	2260	(164)
Carbon tetrachloride	0.5	ND	(362)
Chlorobenzene	100.0	ND	(252)
Chloroform	6.0	ND	(150)
1,2-Dichloroethane	0.5	ND	(355)
1,1-Dichloroethene	0.7	ND	(480)
Methyl ethyl ketone	200.0	690	(690)
Tetrachloroethene	0.7	ND	(365)
Trichloroethene	0.5	ND	(390)
Vinyl chloride	0.2	ND	(308)
TCLP SVOC's (mg/L)*			
1,4-Dichlorobenzene	7.5	ND X	(707)
2,4-Dinitrotoluene	0.13	ND X	(769)
Hexachlorobenzene	0.13	ND X	(528)
Hexachlorobutadiene	0.5	ND X	(657)
Hexachloroethane	3.0	ND X	(1000)
4-Methylphenol/3-Methylphen	200.0	ND X	(1240)
2-Methylphenol	200.0	ND X	(790)
Nitrobenzene	2.0	ND X	(389)
Pentachlorophenol	100.0	ND X	(192)
Pyridine	5.0	ND X	(1800)
2,4,5-Trichlorophenol	400.0	ND X	(586)
2,4,6-Trichlorophenol	2.0	ND X	(485)
TCLP Metals (mg/kg)			
Arsenic, SW6010	5.0	0.2	
Barium, SW6010	100.0	0.00649	
Cadmium, SW6010	1.0	<0.0171	
Chromium, SW6010	5.0	<0.0162	
Lead, SW6010	5.0	4.93	
Silver, SW6010	5.0	<0.0109	
Selenium, SW7740	1.0	0.466	
Mercury, SW7471	0.2	0.099	
Total Chlorine (mg/kg)	-	ND	(1320)
Ignitability (deg. F)	-	76.0	

X--Analyzed at lowest dilution possible due to sample matrix effects.

\*-- Reported in mg/kg and converted to mg/L.

**APPENDIX G**

**Geophysics and Soil Gas Reports**

## **Geophysics Report**

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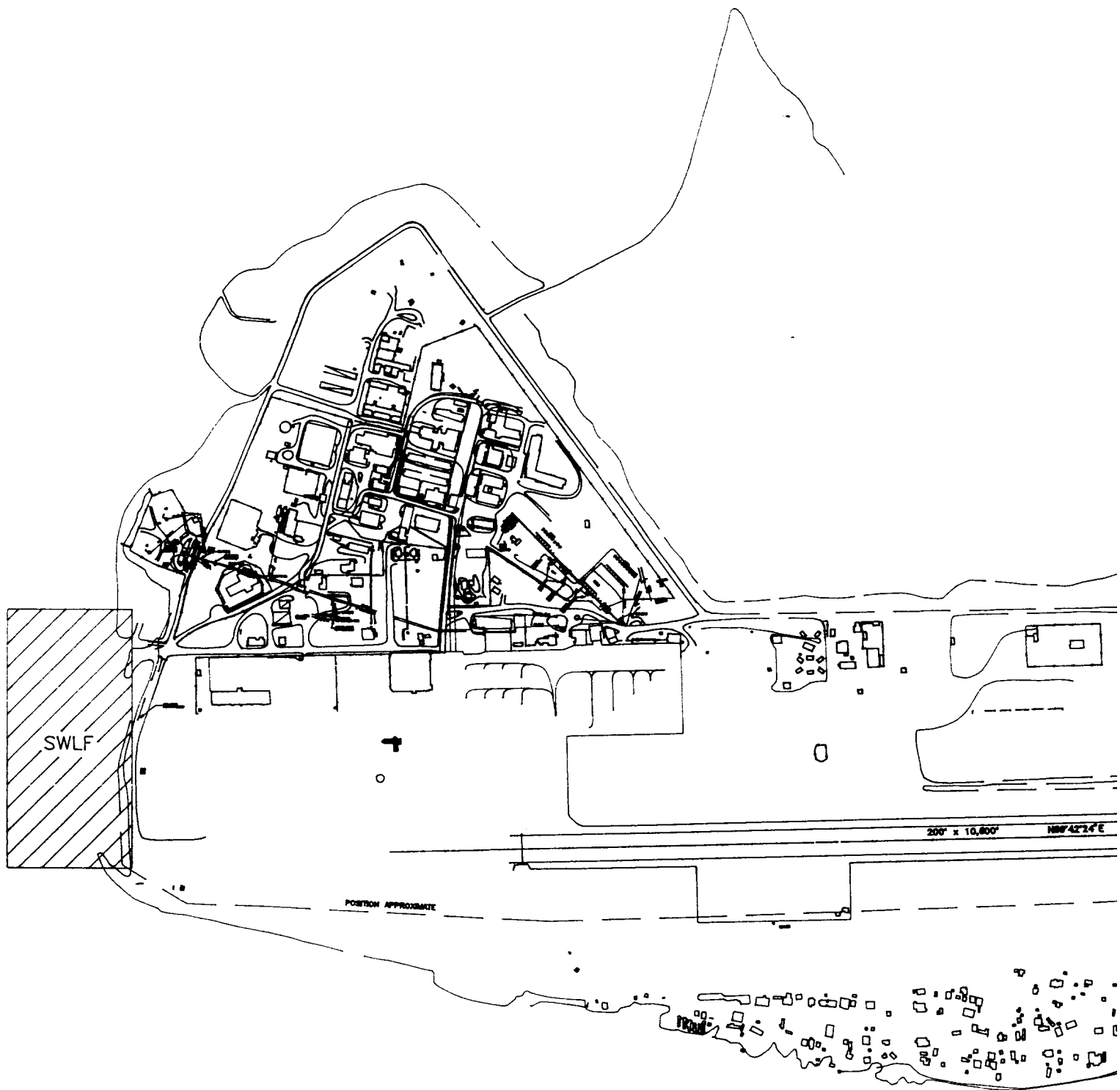
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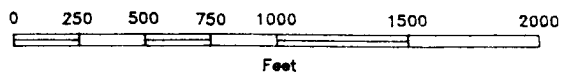
Geophysical surveys utilizing both ground penetrating radar (GPR) and induction electromagnetic methods (EM) were performed at four sites at the Galena Air Force Station between 25-July 1993 and 9-August 1993. These surveys were carried out to address two objectives. First, GPR and EM were utilized at the Fire Training Area (FTA) and the Ambient Site to determine the depth to permafrost. Second, EM and GPR data were used to identify potential buried hazards at two sites identified as areas of waste disposal, the Southwest Landfill and the Alternate Landfill. The data from all sites were analyzed in the field and used to guide subsequent soil gas/groundwater field screening sample collection.

The FTA is located north of the east end of the runway inside of the perimeter dike and has been used to train fire fighters. The Ambient Site is located due east of the FTA in a baseball park used for the Galena community. This area was investigated to establish background as the area has not been used for base operations. The Alternate Landfill Site is located north of the former runway radar tower on the north side of the dike road. This site has served as a landfill for solid waste when access to the active landfill was not possible. Initially it was believed that a small dumping pit was located adjacent to the outer dike road and the Yukon River, southwest of the western end of the runway. This site was designated the Southwest Landfill Area. After discussions with local persons familiar with the Southwest Landfill, it was apparent that the entire area west of the runway may have been used for disposal. Figure 1-1 shows the locations of all four of the sites on a map of the Galena area.

This report discusses the methods and results of the geophysical surveys, and presents recommendations for future action to assist in subsequent field efforts. This document discusses general data collection theory, instrument parameters and field methods for the entire site.



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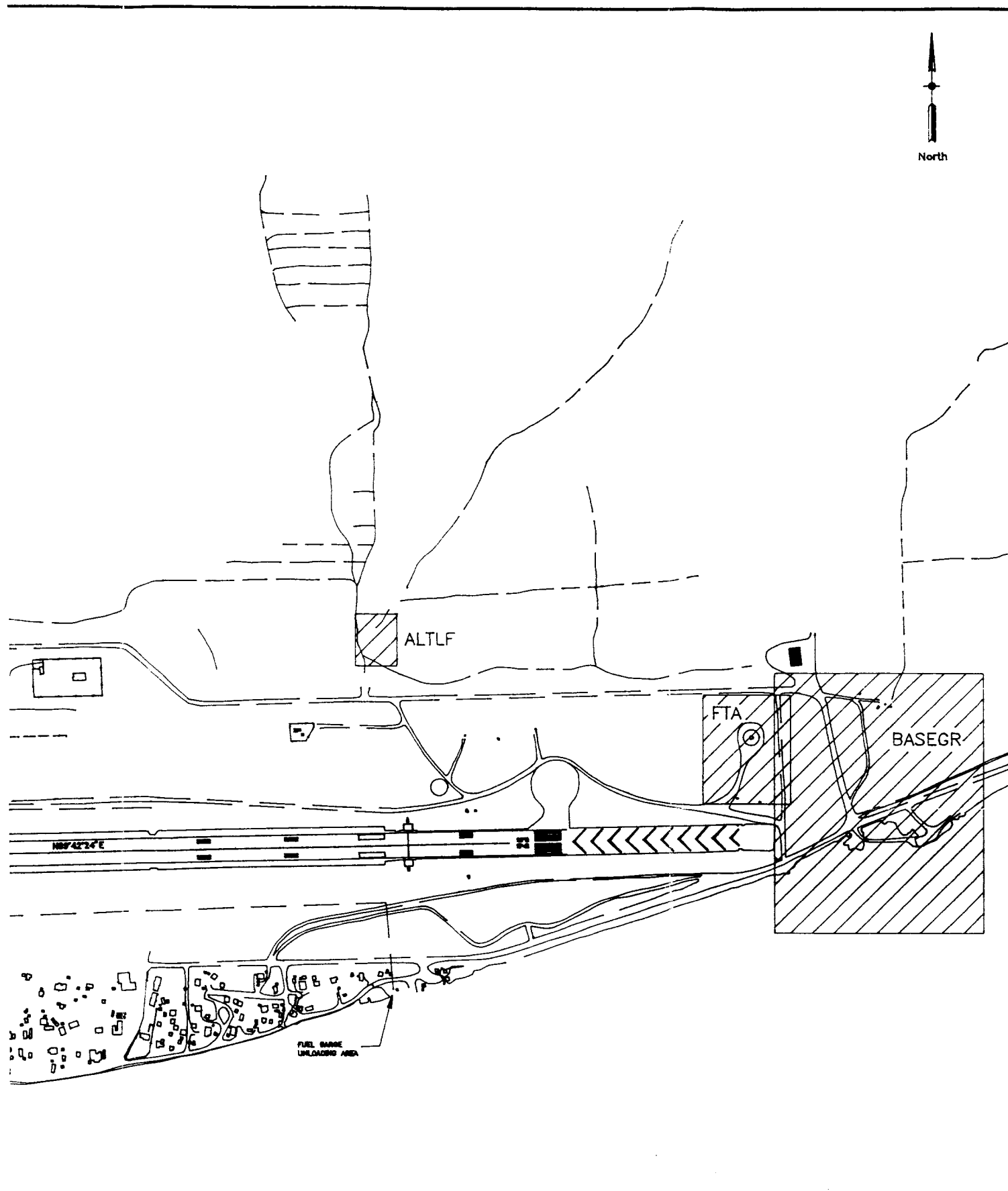


Figure 1-1. Locations of Geophysical Surveys

## **2.0**

### **Investigation Background and Methodology**

Two geophysical instruments were used at the Galena AFS sites. A Sensors and Software, Inc. PulseEkko IV instrument was used for the collection of the GPR data and a Geonics EM-31 terrain conductivity meter was used to collect the conductivity data. Both tools were used at all investigation sites. At the Ambient and FTA Sites, radar data were collected initially, followed by the EM-31 data. At the Alternate Landfill Site and the West Landfill Site, the EM-31 was used first to locate potential anomalies, followed by GPR to determine the boundaries and depths of these anomalies.

## **2.1**

### **Ground Penetrating Radar**

GPR works by transmitting a radar impulse of a selected bandwidth into the ground via a transmitter, and receiving a reflected signal back from objects/strata in the subsurface. The strength of the reflected signal and the delay for its return vary with the electrical properties and depth of the reflectors. These readings are displayed as a graph of signal intensity on a profile with horizontal locations along the X axis and time along the Y axis. The time axis can be converted to depth using approximate velocities of the travel time of the radar wave in the soil. Using several profiles collected across a subsurface feature or anomaly, a contour map of this feature can be created.

The frequency of radar antennae used determine both the resolution of the survey and the depth of penetration. In general, the higher the antenna frequency the shallower the depth of resolution. Three antenna frequencies were available for use at Galena, 50 megahertz (MHz), 100 MHz, and 200 MHz. The antenna were chosen for each site depending on what depth of investigation was desired.

The GPR equipment used at the Galena AFS consisted of several components. The Sensors and Software GPR consists of separate transmitting and receiving antennae which can be moved independently of each other or in tandem. These antennae

are attached to PVC handles, which also carry the transmitter and receiver assembly. These are attached to a control box datalogger and a 12-volt battery which were pulled behind the radar antennae in a small cart.

Having the transmitting and receiving antennae separated allows the system to be "tuned" for various frequencies and depths. For each frequency of antenna, various spacings between the transmitting and receiving antennae can be tried to determine which gives the best resolution.

In the field, the datalogger displays the radar data as they are being collected. The data can be reviewed on a screen during collection in order to verify that the instrument is working properly and that data are being recorded. In addition, the datalogger automatically writes the data to a disk so it can be used for more advanced signal processing at a later date.

### **Data Display**

GPR data are normally displayed with horizontal location along the X axis and time along the Y axis. This time data can be converted to depth if the proper velocities of the propagated wave through the soil are known. The displays presented in this report were generated using proprietary display routines developed for the commercial software MATLAB®. The "depths" are given as two-way travel times to the event in nanoseconds (ns) with an estimation of the true depth in parentheses. An average velocity of .225 feet/ns (two-way travel time) was assumed for the soil velocity at Galena. Using this velocity, each 100 ns in time represents about 11 feet in depth.

### **Equipment Setup and Methods of Data Collection**

Prior to running the actual surveys, several test lines were run at the FTA to determine which antenna frequency would give the best resolution and depth of penetration.

The initial survey lines indicated that the 100 MHz antenna would be sufficient for resolution of the subsurface in the first 15 feet and that the 50 MHz antenna would be used to achieve deeper depths of penetration. A spacing of 5 feet between the 50 MHz antennae and 3 feet between the 100 MHz antenna was determined to give the best resolution for each of the two frequencies used.

Since the target depth at the FTA was the deep permafrost, the 50 MHz antennae were used. The 50 MHz antennae would allow for the deepest penetration of the radar signal. At the Alternate Landfill and the West Landfill Sites where resolution of shallower features was desired, the 100 megahertz antennae were used to define the lower boundaries of the landfills and the depths to any potential anomalies.

After the proper antenna spacing and trace-to-trace spacing was established, the survey lines were located. The results section describes the locations of the survey lines for each area. The collection of the GPR data was done in the following manner:

- Stretch out a cloth or fiberglass tape along the length of the GPR line to be collected;
- Collect the data by moving the GPR antenna along the tape in 1-foot increments, and
- Move the tape and collect the next line.

At the end of each day, the GPR data were downloaded from the datalogger on to 3.5" computer disks and reviewed for quality of data and potential anomalies.

## **2.2 Electromagnetic Survey**

The EM instrument measures the ground conductivity by inducing a magnetic field into the ground by running an alternating current through the transmitter coil. This magnetic field induces small currents in the earth, which in turn generate a secondary

magnetic field. The electrical instrument receiver records both the primary and secondary magnetic fields, and displays a terrain conductivity based on the ratio of the primary to secondary magnetic fields (Quadrature), or as an absolute reading of the secondary magnetic field (In-phase).

The EM-31 device measures ground conductivity with an effective depth of investigation of 10 to 18 feet. The instrument consists of a fixed-spaced transmitter and receiver located on either end of a 12-foot boom. The instrument is strapped over the shoulder and held at waist height. The electronics of the instrument are located in the middle of the boom and continuously display the data on a digital or analog screen. A datalogger records this data automatically at pre-determined time increments or by manually pushing a button at grid nodes.

Two types of readings can be obtained from the instrument, a quadrature (out-of-phase) reading and an in-phase reading. The quadrature phase reading measures the ground conductivity and is more sensitive to disturbed soil while the in-phase reading is more sensitive to buried metallic objects. Comparison of these readings allows the determination of the source of an anomaly.

In addition to the two types of readings, data can be recorded with the transmitter/receiver dipoles oriented either horizontally or vertically. The vertical position is the normal mode of operation. The instrument can be rotated 90° and put in the horizontal dipole mode with receiving coils oriented in a vertical position. When oriented in the vertical dipole position, the instrument response comes from the entire depth of penetration. For the horizontal dipole configuration, most of the instrument response comes from the first 6 feet of depth. When comparing data taken in both orientations, one can get a relative determination as to the depth of the anomaly. This technique was used at the FTA to determine if shallow permafrost was present.

### **Data Display**

All of the EM data was processed for display in the field. After collection of the EM data, the data points were downloaded from the datalogger and converted to data points on a cartesian grid. Contour maps of the gridded points of both readings were then generated to determine the locations of the potential anomalies. The contour maps presented in the following report are shown in color scale to accentuate the anomalous zones.

### **Equipment Setup and Methods of Data Collection**

Prior to collection of the EM data, the instrument was calibrated and checked following the manufacturers instructions. All calibrations were done near the FTA in the open field between the runway and the north edge of the dike road in an area expected to be free from subsurface metal. No problems were encountered with the initial calibration of the equipment.

EM data for each site were collected at predetermined grid nodes after the establishment of the grid corners. At the FTA, Alternate Landfill Site, and West Landfill Site, the grid nodes were established by stretching out a pre-marked rope along the edges of the grid and collecting the data at the marked nodes. The data at the Ambient Site was collected using pace and compass techniques as a result of obstructions such as the baseball diamond and the tall grass. The data were then fitted to the map based on the known locations of the end of the grid lines.

### **3.0 Results of the Investigation**

The geophysical investigation yielded excellent results for the definition of past waste disposal sites. The combination of the EM and GPR data worked effectively to delineate the size and depth of the waste pits. Unfortunately, the geophysical techniques met with mixed results in determining the location and depth of permafrost. The results of the surveys at each site are presented in the following sections.

#### **3.1 Ambient Site**

EM and GPR data were collected at the Ambient Site to help in defining geophysical anomalies that could be the result of shallow permafrost. These data were collected to help in determining the response of permafrost on GPR and EM instruments for interpretation of the FTA data. Permafrost is known to be present at the Ambient Site as several boreholes were abandoned during the 1992 RI field season after encountering shallow permafrost in the area of the baseball field.

##### **Data Grid and Data Collection**

Initially, six GPR lines were collected at the Ambient Site to determine if a radar anomaly would result from the presence of shallow permafrost. Since it was known that the permafrost was detected around 10-feet bgl at this site in the past, 100 megahertz antennae were used with the GPR to get better resolution of the shallower features.

In addition to the GPR transects, an irregular grid of approximately 700-feet by 400-feet was used for an EM survey. Grid node spacing was approximately 40-feet by 20-feet. Because of high grass and the man-made obstructions around the baseball field, the lines along which the EM data were collected were determined by compass bearing, and paced distances. A rope marked in 20-foot increments was stretched out on the ground along the same line as radar profile BASE2. This line was used as the northern base line

for subsequent data collection. All transects were taken at 90-degrees to this baseline. After the EM survey was complete, the data were adjusted to fit landmarks on the basemap to the known locations of the ends of the lines. Figure 3-1 shows the location of the EM grid and the GPR lines at the Ambient Site.

## **Results**

Figure 3-2 is a contour map of the ground conductivity data collected at the Ambient site. A linear anomaly can clearly be seen trending northwest from well 04-MW-03. The anomaly seen in the ground conductivity map is also visible in the in-phase map (Figure 3-3), but is not as pronounced. This anomaly crosses GPR line BASE3 from trace 150 to 200 (Figure 3-4). In comparison to the features identified during the GPR survey, the origin of the anomaly is not clear. Based on the in-phase response, it is probable that the middle part of the anomaly may represent a metallic object. A similar anomaly was detected on the west edge of the grid. This anomaly also is likely to represent an isolated piece of buried metallic debris.

A continuous anomaly exhibited on the GPR lines at the Ambient site could be interpreted to represent shallow permafrost. This event is clear on GPR lines BASE1, BASE2, and BASE4 (Figure 3-5) and is represented by the curved surface at about 100 ns (11 feet) on the records. A downward dipping reflector which may be the edge of the permafrost can clearly be seen on lines BASE1 at trace 550 and BASE4 at trace 425. This anomaly is approximately 10-feet to 14-feet deep and extends over the area of where the baseball field is located. Figure 3-6 is a contour map of the top of this anomaly and its approximate limits, where detectible. This area corresponds to the area where numerous holes were drilled and permafrost was encountered during the 1992 field investigation.

Two other distinct anomalous events were also detected with the GPR records. a convex-downward anomaly can be seen on line BASE2 (Figure 3-7) at trace 300 and on



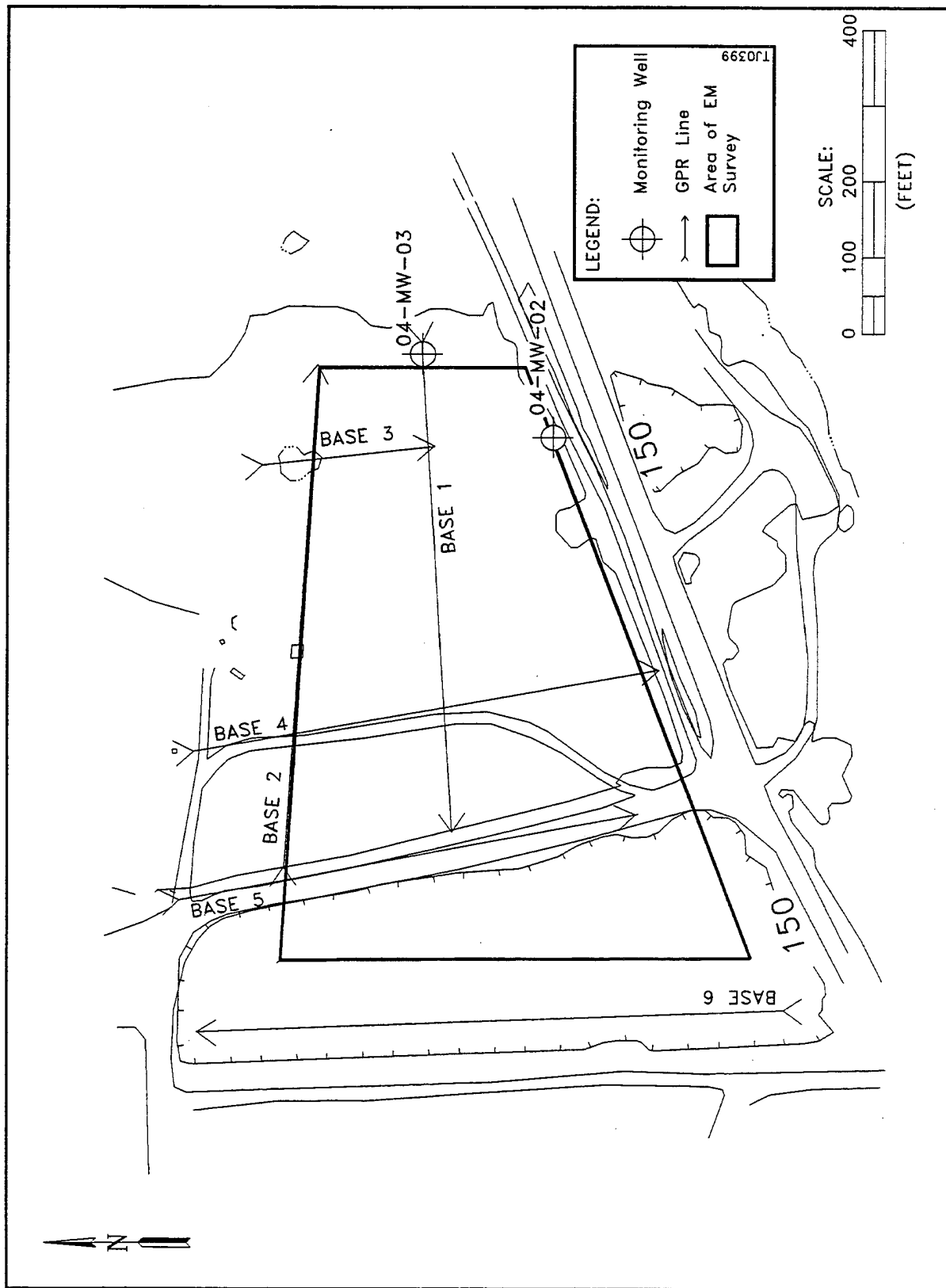


Figure 3-1. Outline of EM Grid and Location GPR Lines at the Ambient Site

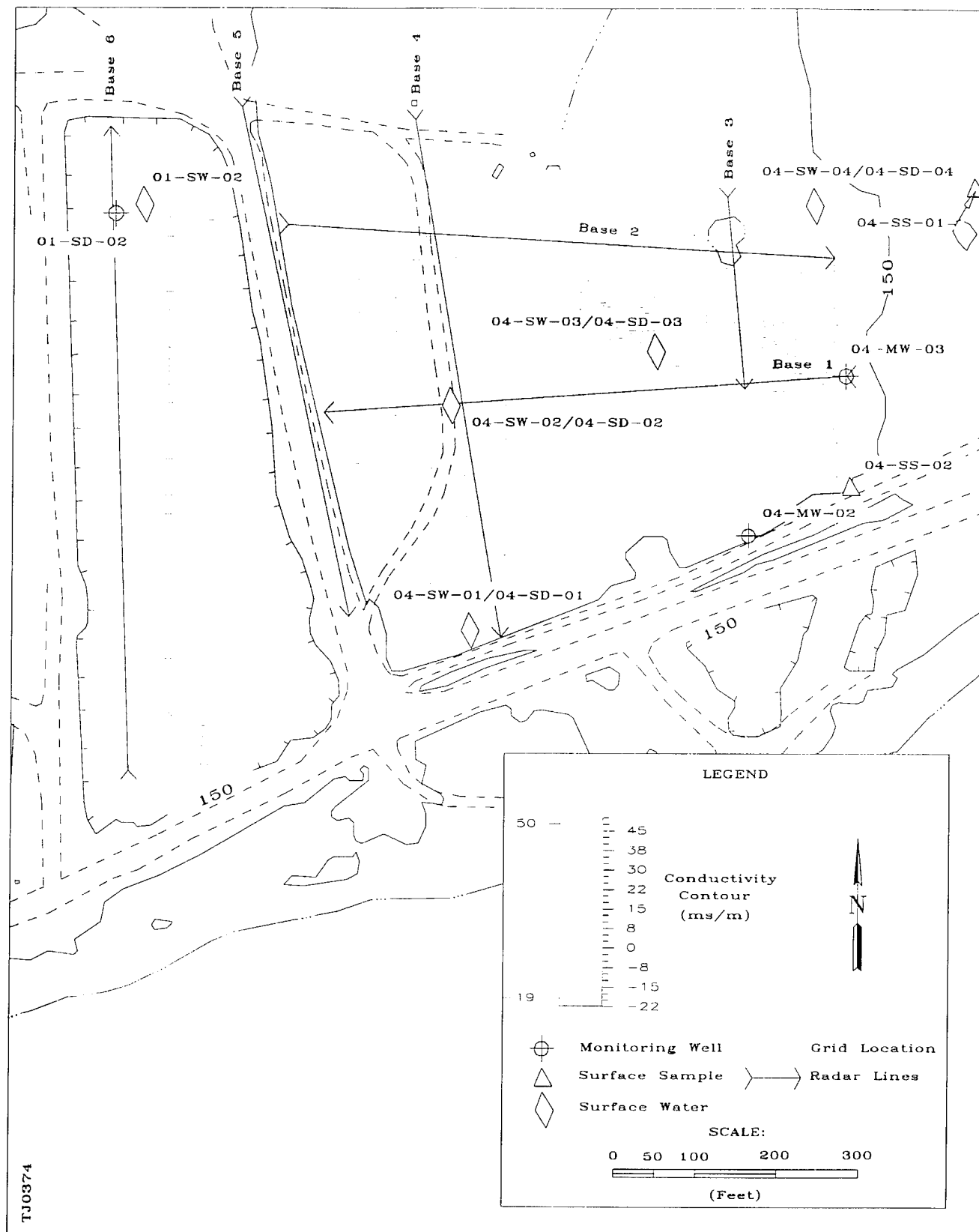


Figure 3-2. Conductivity Contour Map of the Ambient Site

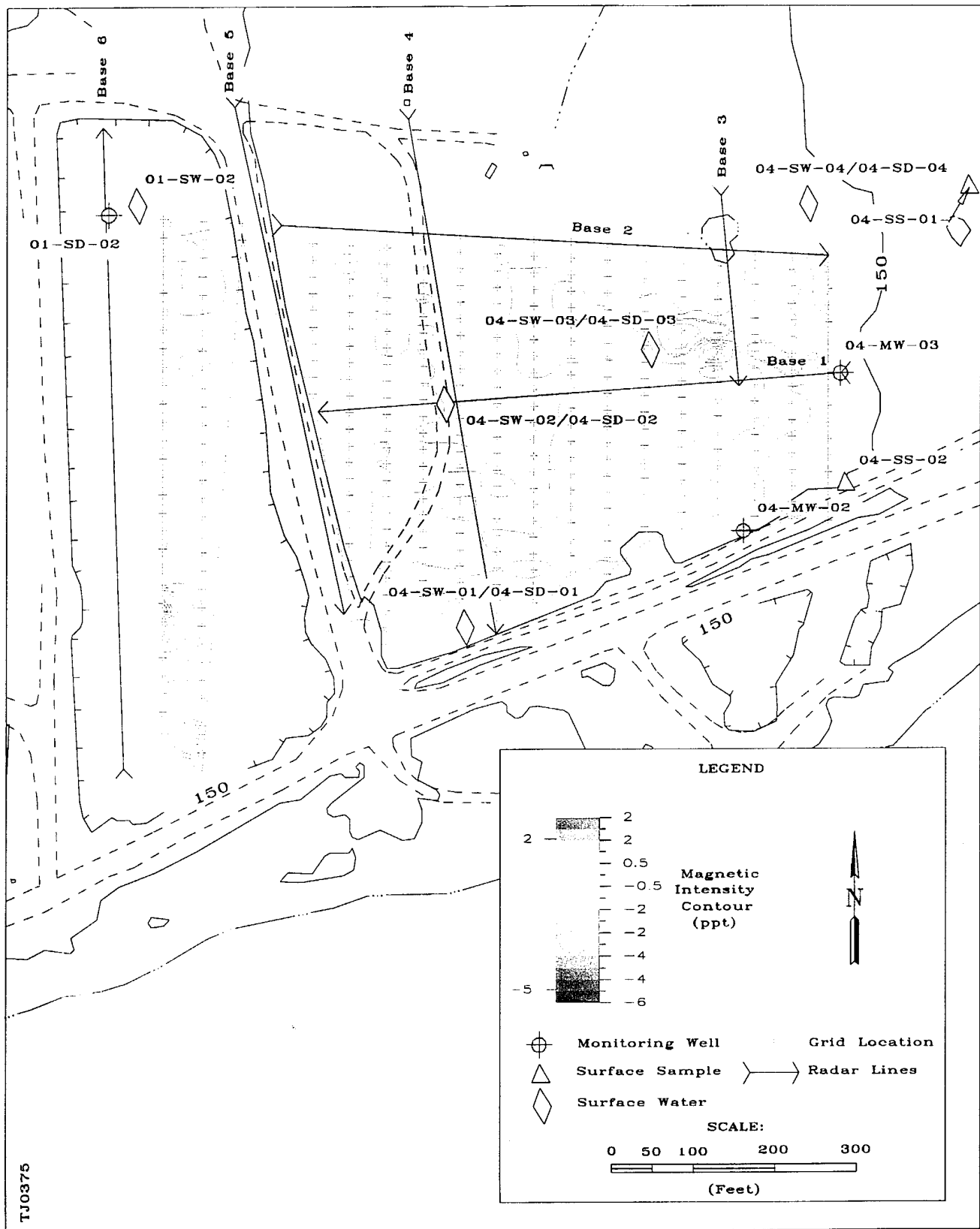


Figure 3-3. In-Phase Contour Map of the Ambient Site

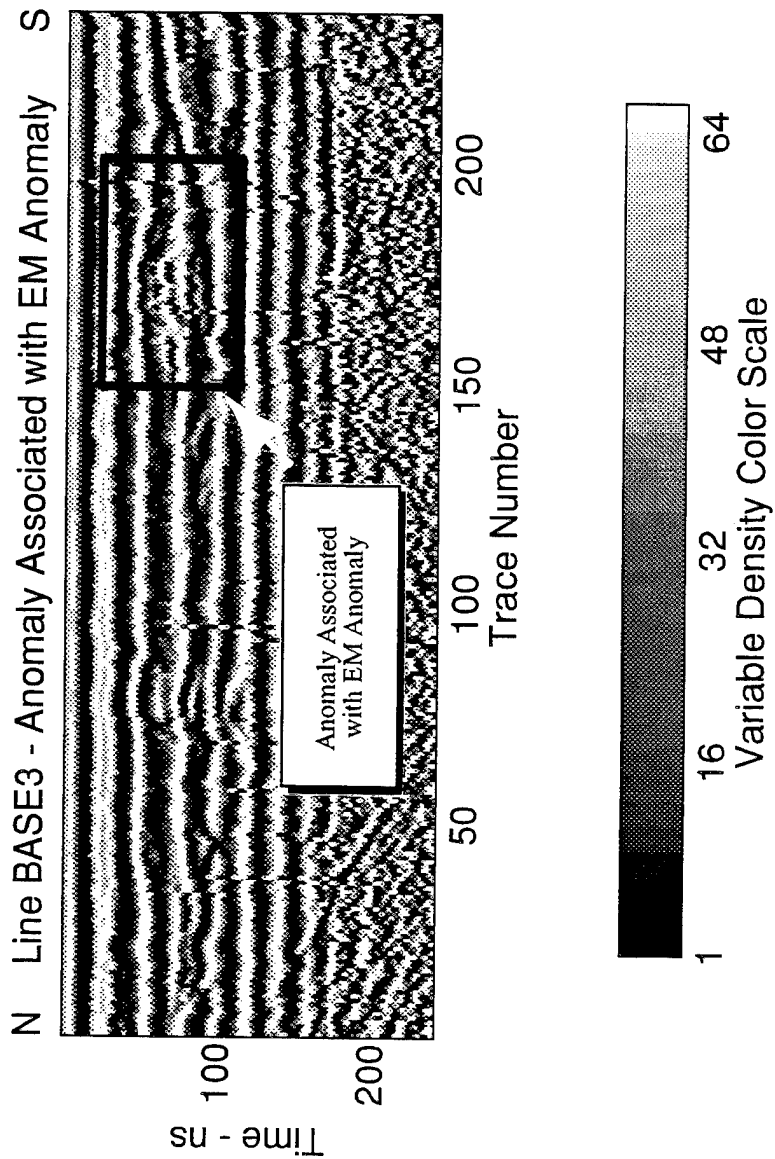


Figure 3-4. GPR Line BASE3 Showing Crossing of EM Anomaly

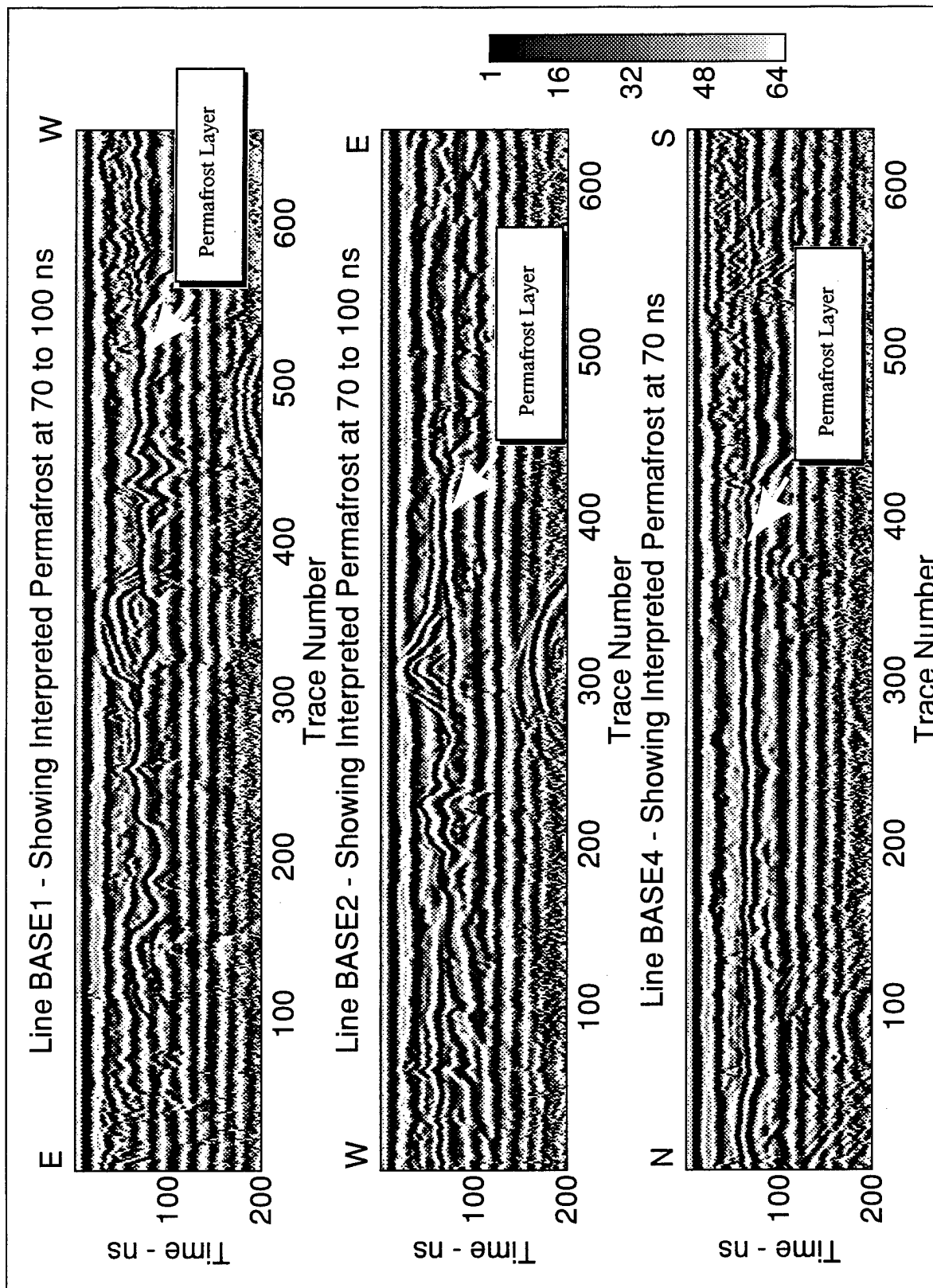


Figure 3-5. GPR Lines Showing Permafrost

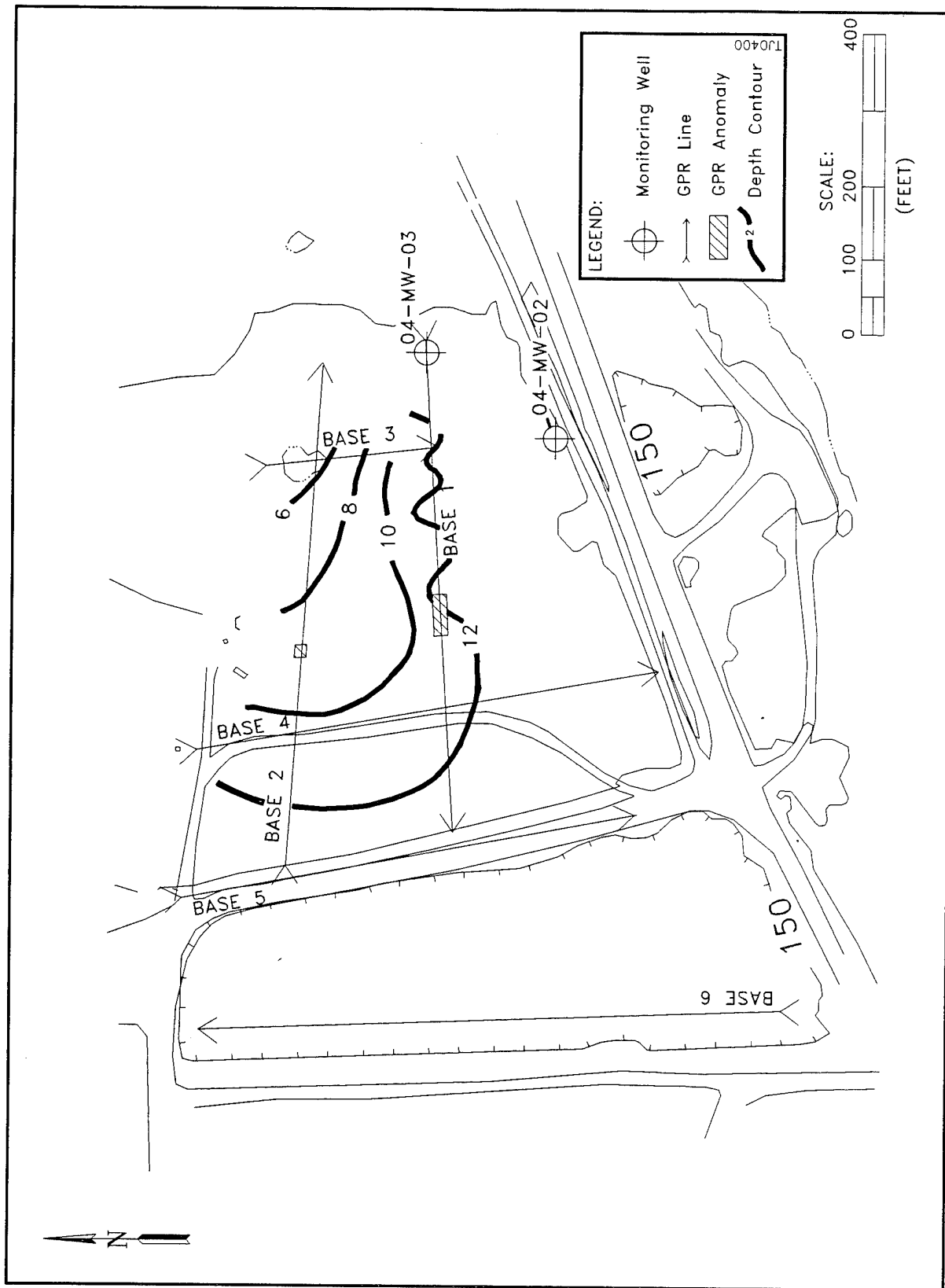


Figure 3-6. Contour Map of Interpreted Top of Permafrost

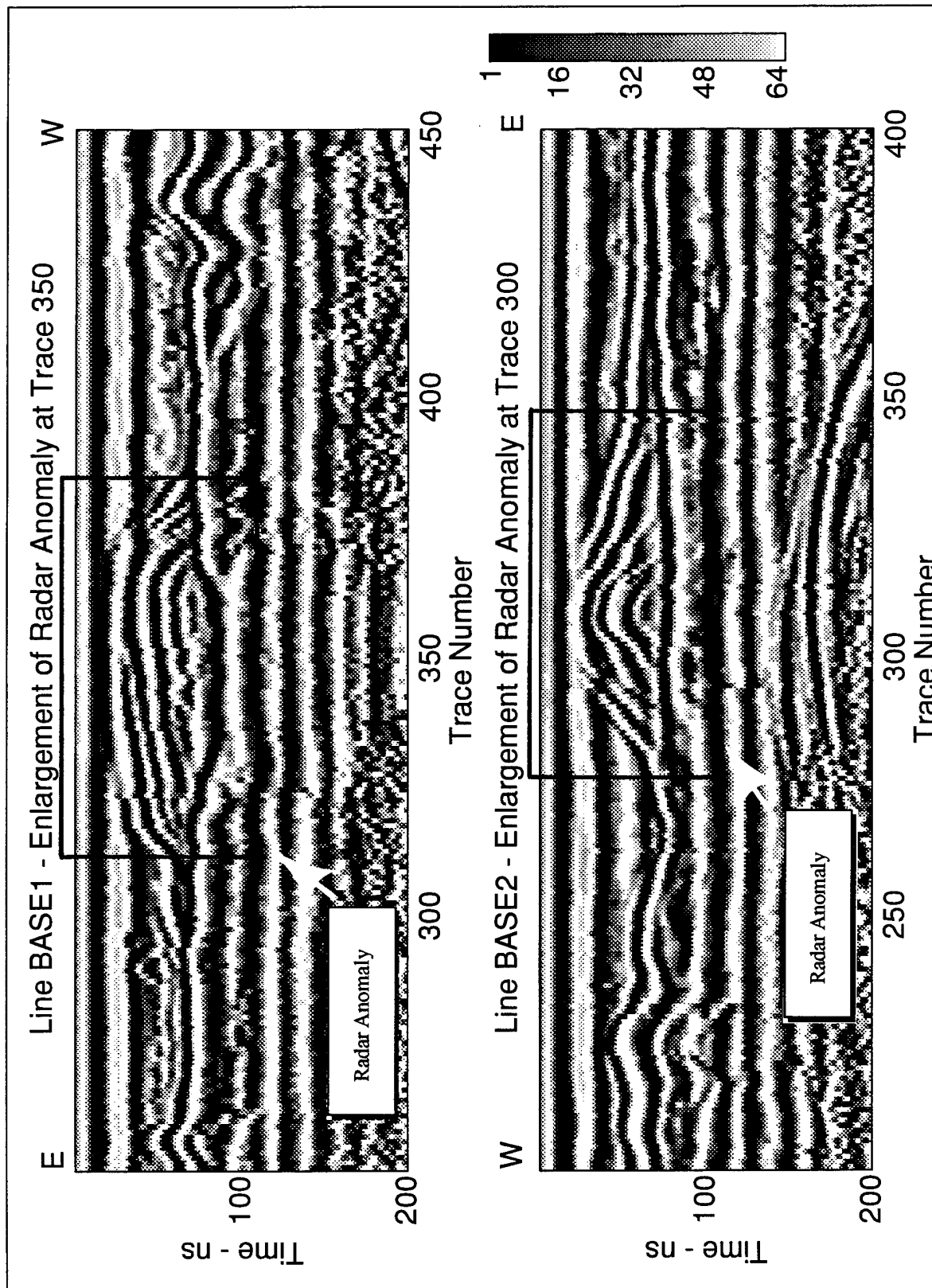


Figure 3-7. GPR Lines Showing Radar Anomalies

BASE1 at trace 325 to 375. These are highlighted on Figure 3-6. It is not known if these anomalies form a continuous event and their origin is unclear.

### **3.2 Fire Training Area**

The geophysical investigation at the FTA was undertaken to determine if continuous permafrost could be detected under the site in order to assess the effect of the permafrost layer on groundwater flow. This information was also intended to be used to identify drilling locations free from permafrost, as permafrost has frequently caused problems during previous drilling operations at Galena AFS. One target of particular interest at the FTA Site was the permafrost layer encountered at approximately 25 feet below ground level (bgl) in well 01-MW-06 and at 80 feet bgl in 01-MW-01.

#### **Data Grid and Data Collection**

A 300-foot by 280-foot grid was established at the site and the corners were marked with survey stakes (Figure 3-8). After the four corners of the survey grid were established, two ropes that were marked every 20 feet were laid out north-south along the east and west edges of the grid. Fifteen 300-foot radar lines were collected in the east-west direction and 3 lines were collected in the north-south direction. The GPR data was collected using a fiberglass tape as discussed in section 2. The EM data were collected using the same technique, but with ropes marked at 10-foot intervals.

Quadrature and in-phase data were collected in both the vertical and horizontal dipole orientation at the FTA. The data were collected with the instrument placed on the ground to insure a uniform sampling height and to collect data around the mock airplane which was still at the site. As the mock airplane was elevated above ground, the instrument could be placed under the plane and data could be collected at the established grid nodes beneath the plane.



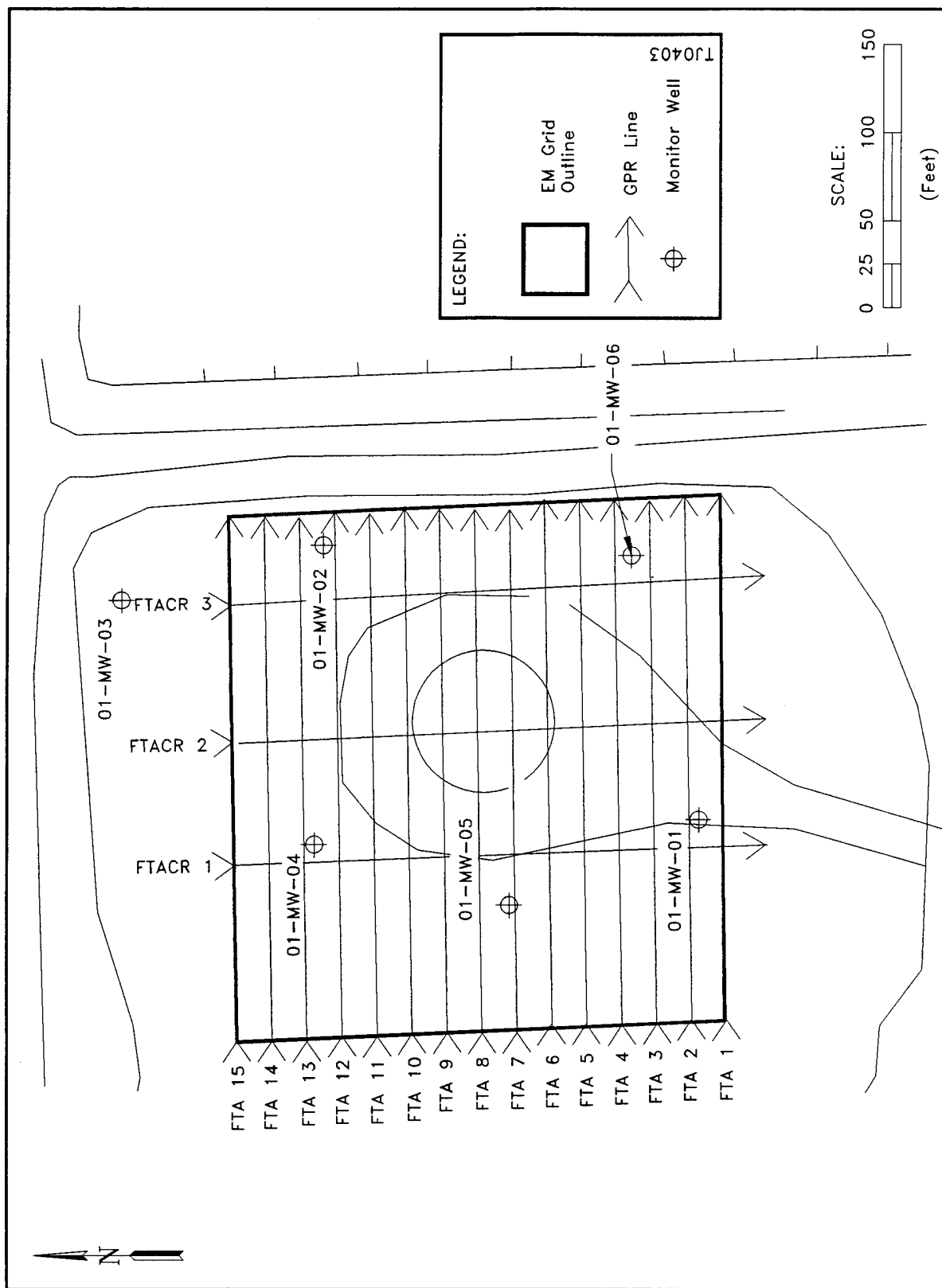


Figure 3-8. Data Grid for EM and GPR Survey at the FTA

## Results

Contour maps of the EM data (Figures 3-9 through 3-12) did not indicate the presence of any detectable trend of shallow permafrost. Figures 3-9 and 3-11 are the quadrature phase (conductivity) contour maps for the vertical and horizontal dipole orientations, respectively. The distinct anomalies located in the center ring of the FTA pit are probably derived from the mock airplane. Two linear anomalies trend from the center of the FTA pit, one due south and the other to the southeast in the direction of well 01-MW-06. The nature of these anomalies is not clearly known, although they may be fuel lines used to spray fuel on the mock plane. Comparison of the vertical and horizontal conductivity contour (Figures 3-10 and 3-12, respectively) indicate that the two linear anomalies probably come from greater than six feet in depth.

The GPR was utilized at the FTA to attempt to detect the permafrost encountered in wells 01-MW-01 and 01-MW-06. A total of fifteen, 300-foot long, east-west lines and three north-south, cross-lines were collected at the site (Refer to Figure 3-8). No continuous permafrost layer was detected on any of the GPR lines. Based on the difference in the dielectric constant of ice and saturated sand (3-4 versus 20-30), permafrost should have been detected on the GPR records, if it were present.

Several factors probably contributed to the inability to detect permafrost. The most likely is that it was not there. The shallow permafrost zones encountered in the previously drilled wells may have melted. Drilling at several areas at the Galena AFS has demonstrated that the "permafrost" encountered during drilling may be isolated lenses of frozen soil, and may not be present from year to year. Based on both the EM and GPR data obtained this summer, there appears to be no continuous permafrost beneath the site which is higher than about 70-feet below ground level (The limit of depth resolution for the radar).

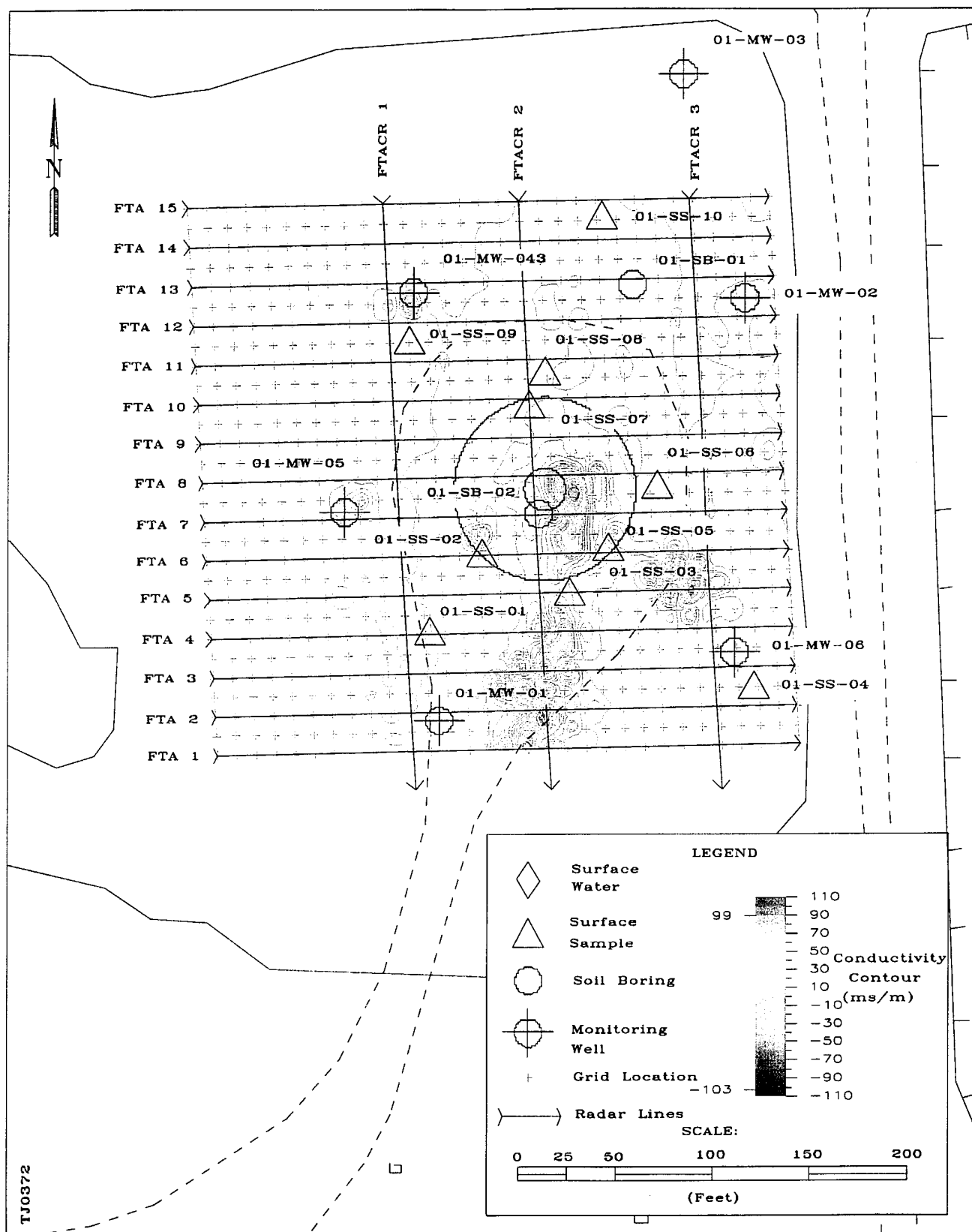


Figure 3-9. Contour Map of Quadrature Phase EM Data, Vertical Dipole Orientation

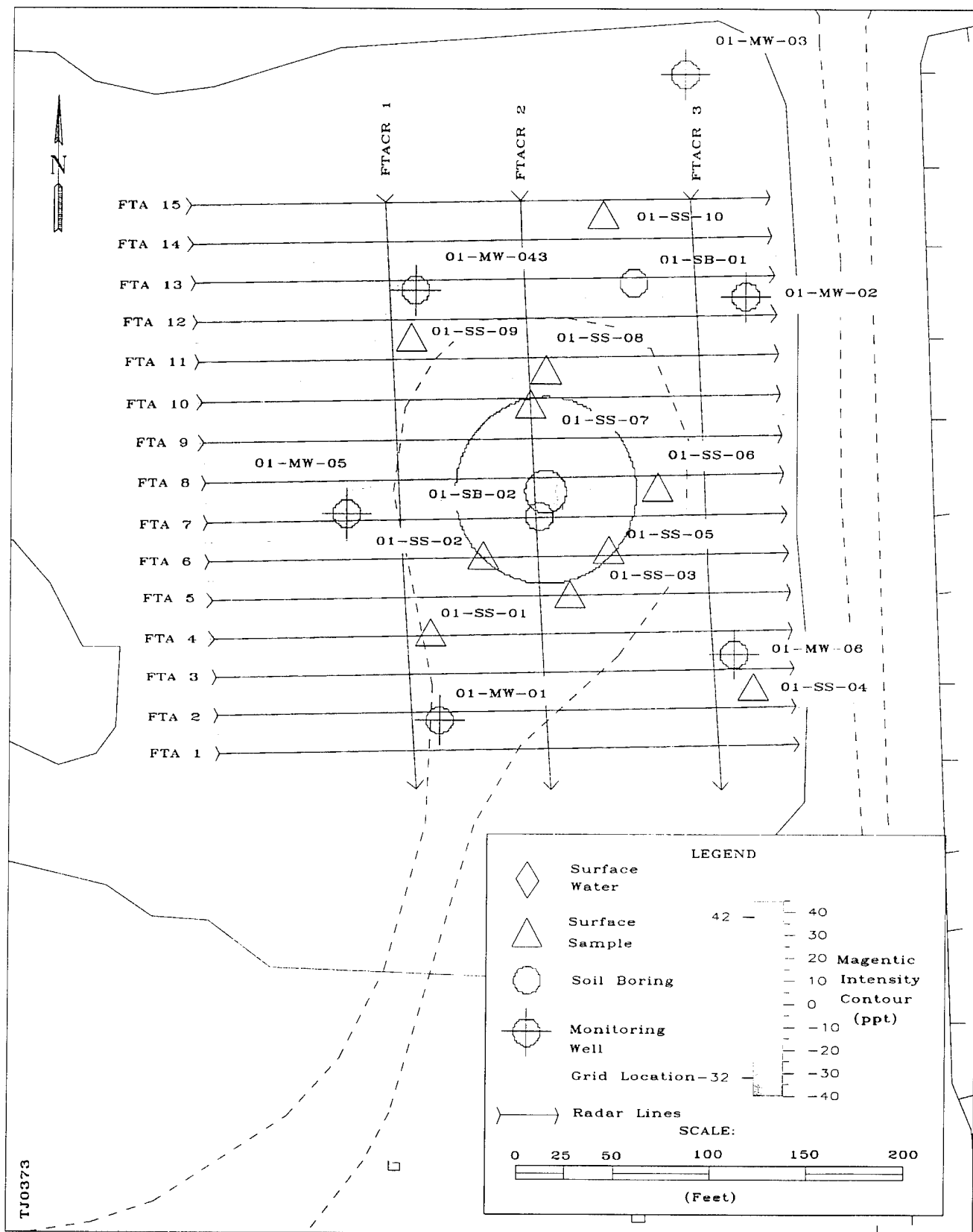


Figure 3-10. Contour Map of In-Phase EM Data, Vertical Dipole Orientation

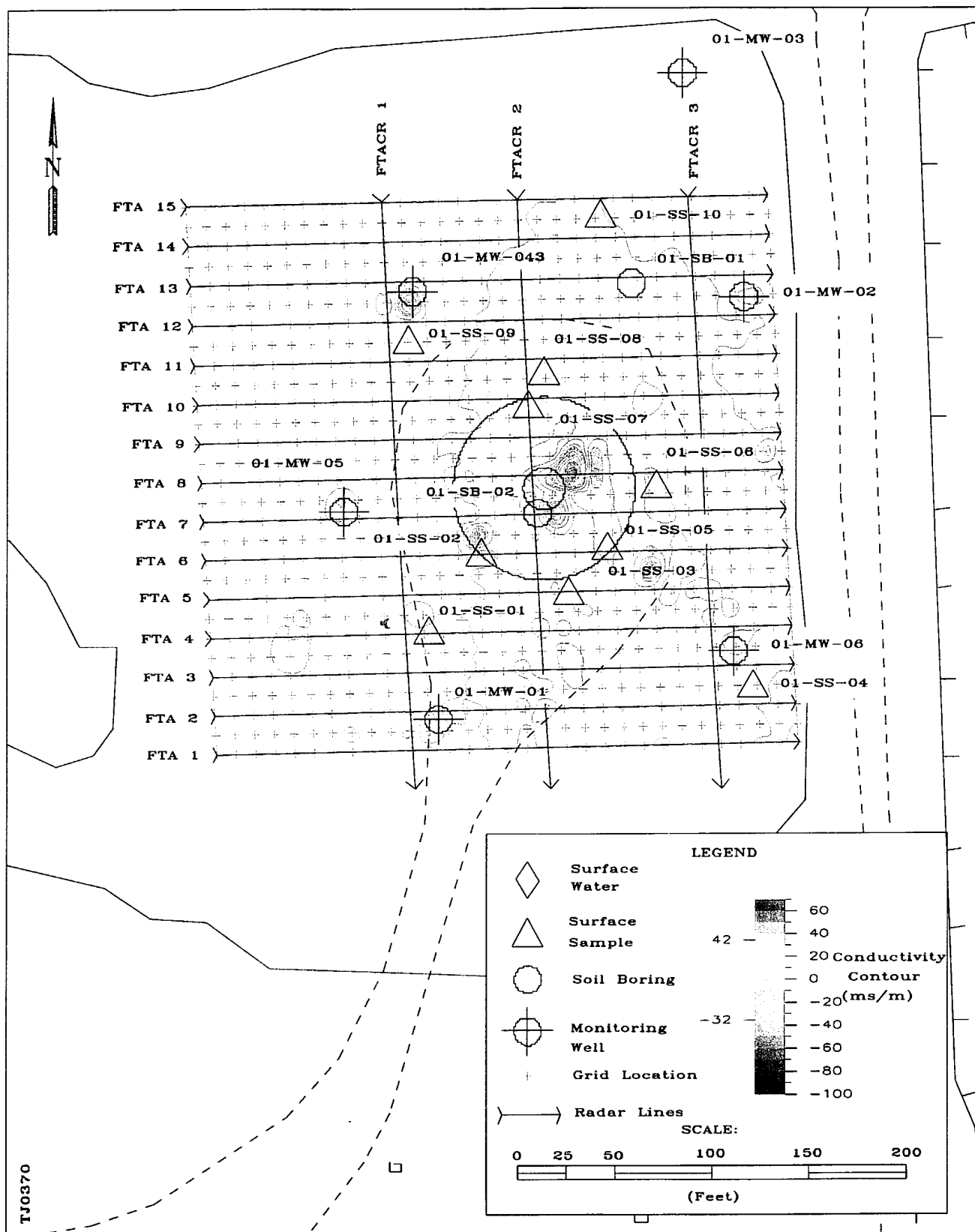


Figure 3-11. Contour Map of Quadrature Phase EM Data, Horizontal Dipole Orientation

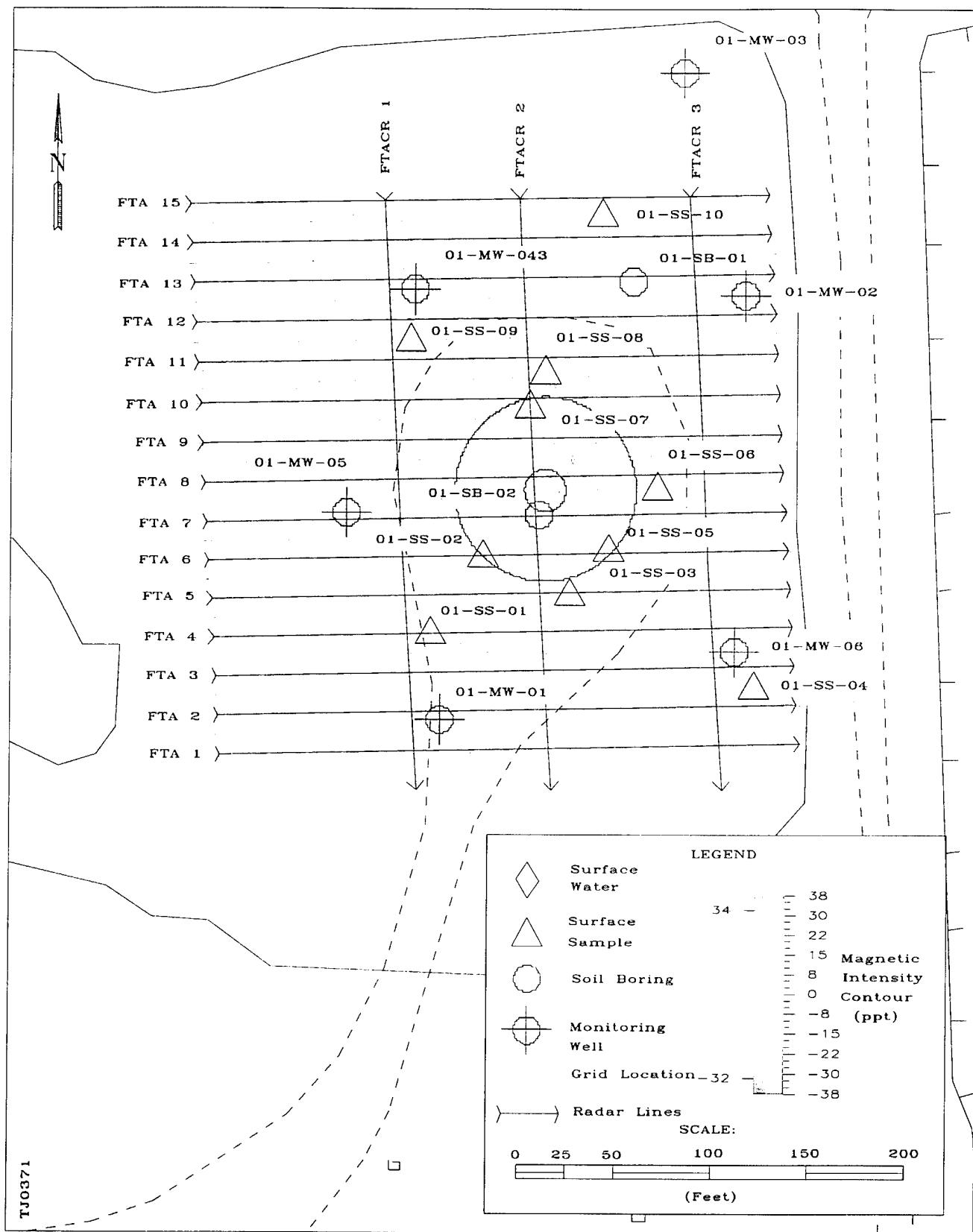


Figure 3-12. Contour Map of the In-Phase EM Data,  
Horizontal Dipole Orientation

Another reason the permafrost may not have been detected is the high conductivity of the groundwater (roughly 1200 ms/m from water samples at the site) which could have interfered with or destroyed the radar signal within the saturated zone. Based on previous drilling logs, the permafrost was encountered below the depth that the water level was during the GPR survey. Still another problem may have been that radar reflections from the mock airplane obliterated reflections from permafrost. For this particular radar system, the antenna are not shielded from above ground interference and the GPR records will show reflections from above ground metallic objects.

Despite the inability to map any continuous permafrost, the radar survey provided important insight into the site stratigraphy. Figure 3-13 shows GPR lines FTA2, FTA7, and FTA13. These lines show a well developed channel between traces 50 and 150, from the surface to approximately 120 to 150 ns (16 feet bgl). The records also show the hummocky cross-bedded stratigraphy expected from an accretionary complex associated with lateral stream migration. Figure 3-14 is a contour map of the base of the channel, and depicts the interpreted environments of deposition. The north-south trend to the channel and the shallow depth indicate that it probably was a fairly recent tributary or slough which cut across the large point bar on which Galena AFS is constructed.

The detection of this channel feature helps explain why boring logs at different locations at the FTA have been difficult to correlate in the first 20 feet to 25 feet below ground level. This channel may also serve as a potential pathway for contaminant migration during high river stages, and may be affecting the groundwater flow at the site.

Another feature clearly seen on the radar record in Figure 3-13 are the strong reflections from the mock airplane. Mapping of the crest of the structure formed by the air arrivals (signals reflected from above ground features) indicate that they come from the mock airplane. By calculating the velocity of the radar wave in air (.95 ft/ns), any point along these strong reflectors can be calculated to be the distance from the ground location of the corresponding radar trace to the mock airplane.

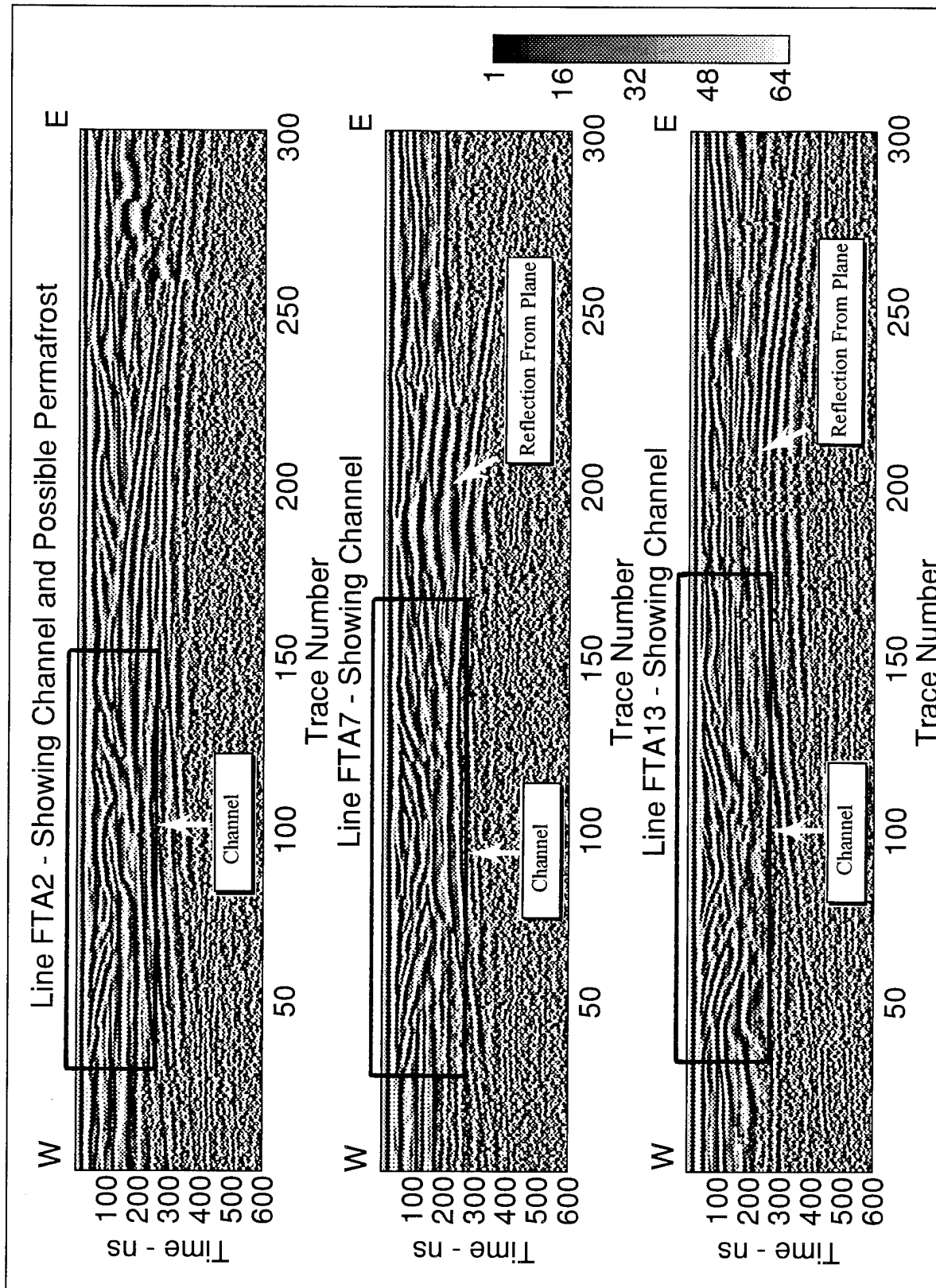


Figure 3-13. GPR Lines Showing Channel Feature



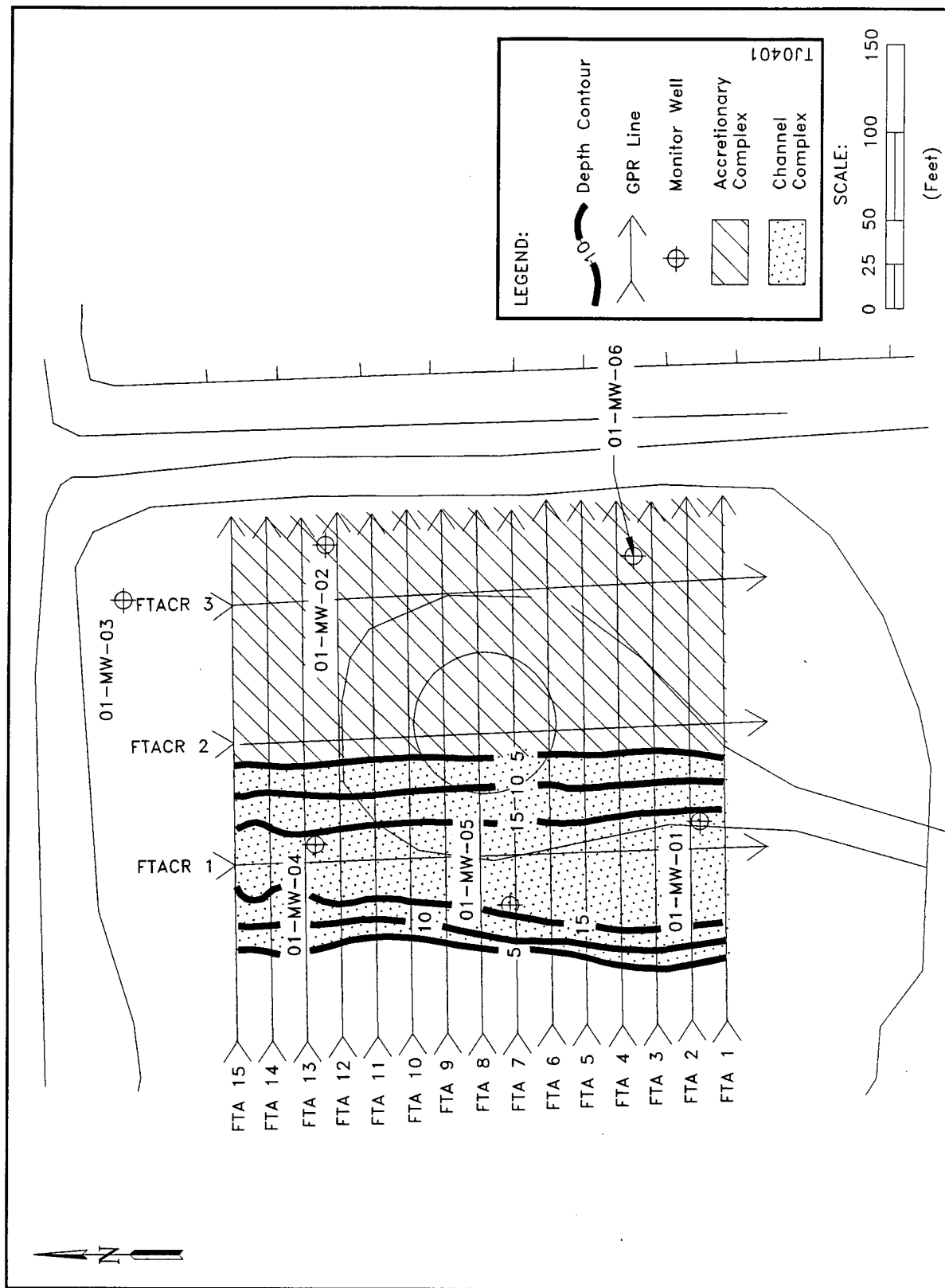


Figure 3-14. Contour Map of the Depth of the Channel

Three other radar anomalies were detected at the FTA. These were on lines FTA2 and FTACR3 in the southeast corner of the grid. Two anomalies appear on line FTA2 between traces 260 and 280 from 60 to 120 ns (7 to 13 feet bgl), and one on line FTACR3 from trace 260 to 290 between 50 and 200 ( 6 to 22 feet bgl)ns (Figure 3-15). Figure 3-16 shows the location of these anomalies. These could represent shallow, isolated lenses of frozen soil such as have been encountered elsewhere at Galena AFS.

### **3.3            Alternate Landfill Site**

The EM and GPR surveys were performed at the Alternate Landfill Site to determine areas of buried metallic objects (caches of drums, etc.), and if possible, the areal extent and the depth of the landfill debris. The site is a relatively flat, cleared area approximately 300-feet by 150-feet. Little vegetation is growing over the exposed area. Much of the eastern and northern sides of the site has remnants of drums, metal machinery (mars) pads, and scrap metal debris exposed on the surface. The northeast corner of the site has a natural depression 3 to 4 feet below the rest of the grade. In addition to the EM data, two GPR lines were collected at the site to determine the depth of the landfill.

#### **Data Grid and Data Collection**

A 120-foot by 260-foot grid was established in the clearing at the site for collection of the EM data. Data were collected on a 10-foot node spacing at the site. Quadrature and in-phase data were collected in the vertical dipole position only. The corners of the grid were later surveyed and the data were tied into the basemap of the site. The outline of the EM grid and the locations of the GPR lines are shown in Figure 3-17.

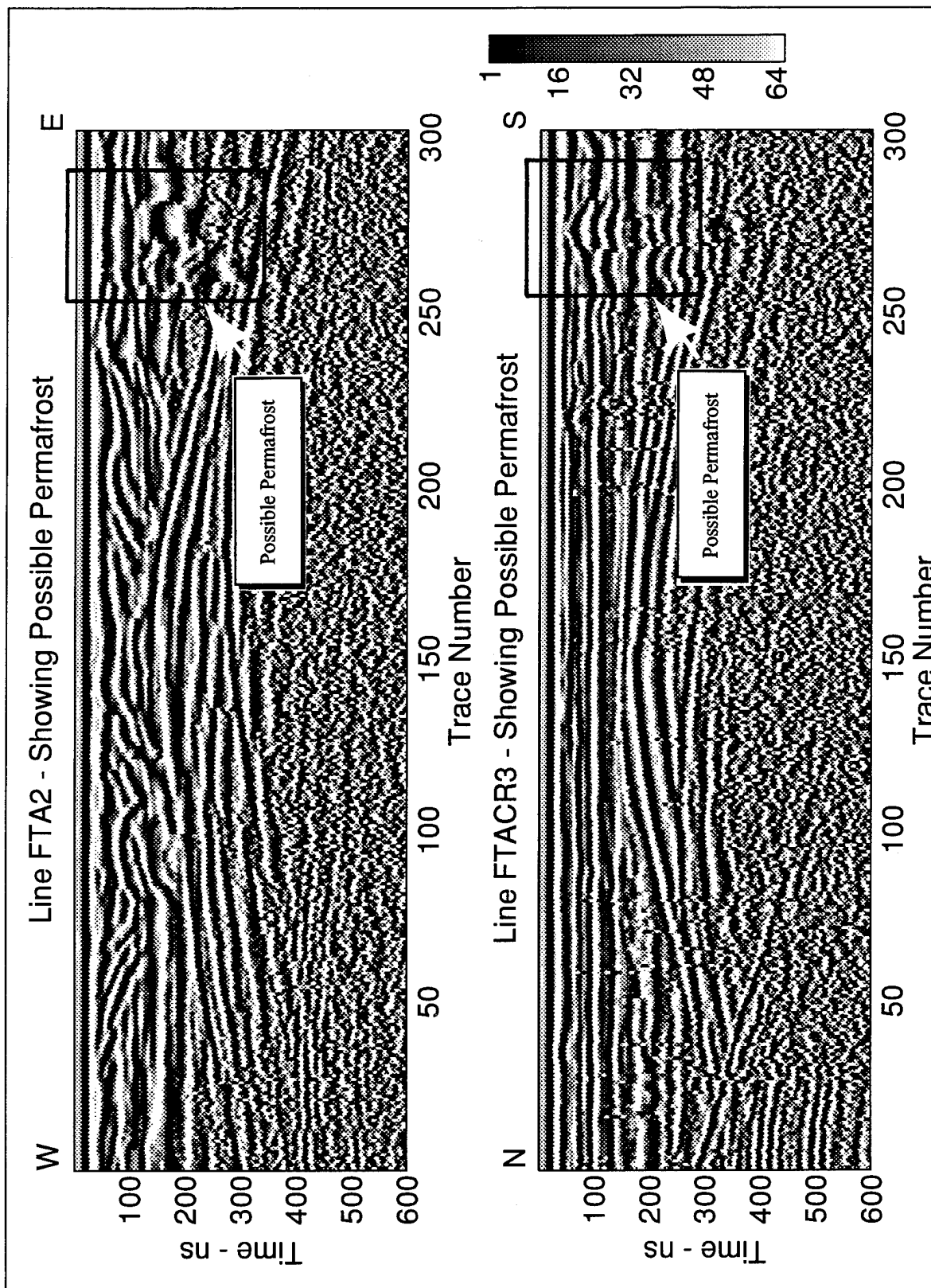


Figure 3-15. GPR Lines Showing Potential Permafrost

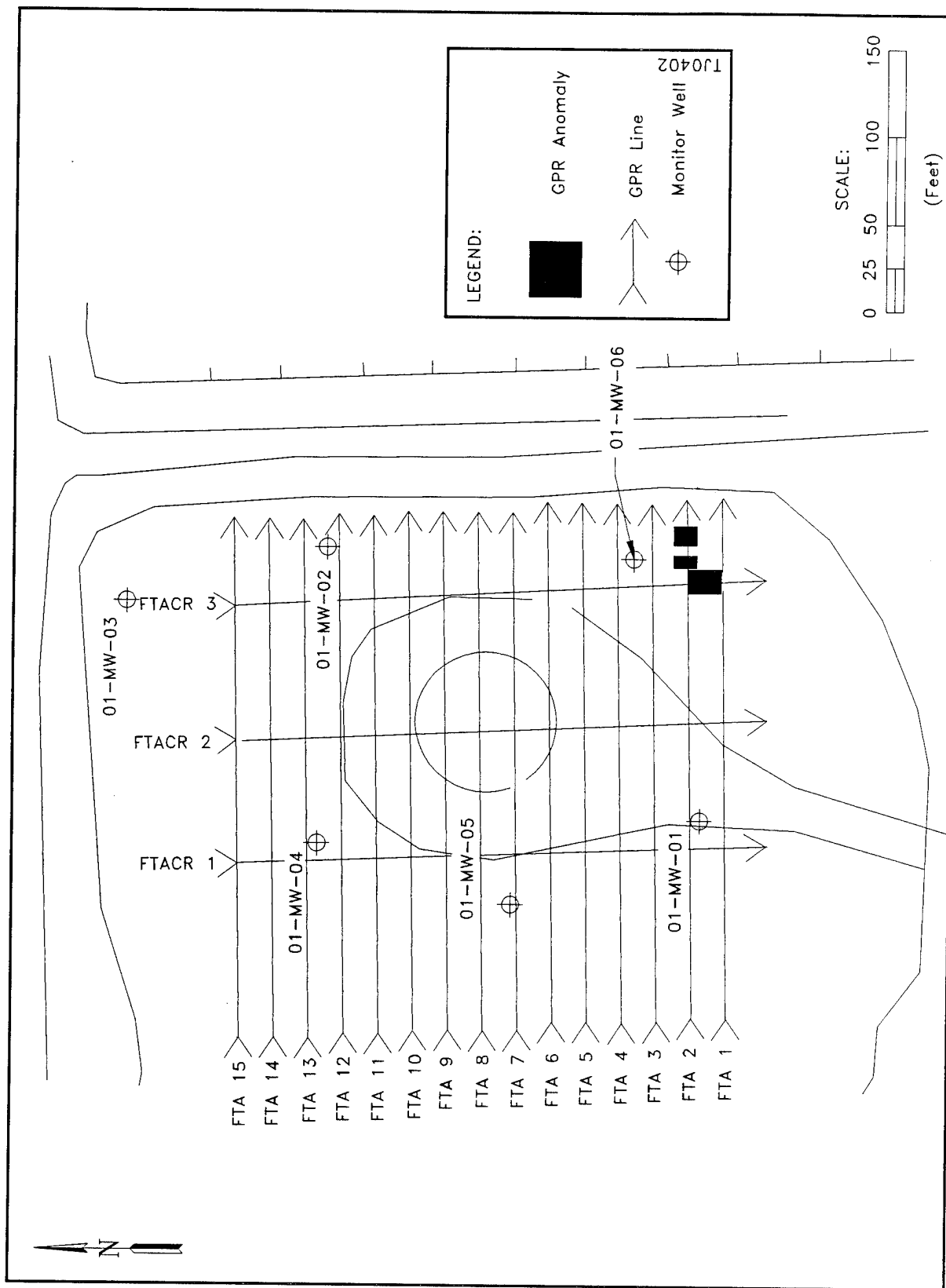


Figure 3-16. Location of Potential Permafrost Anomalies

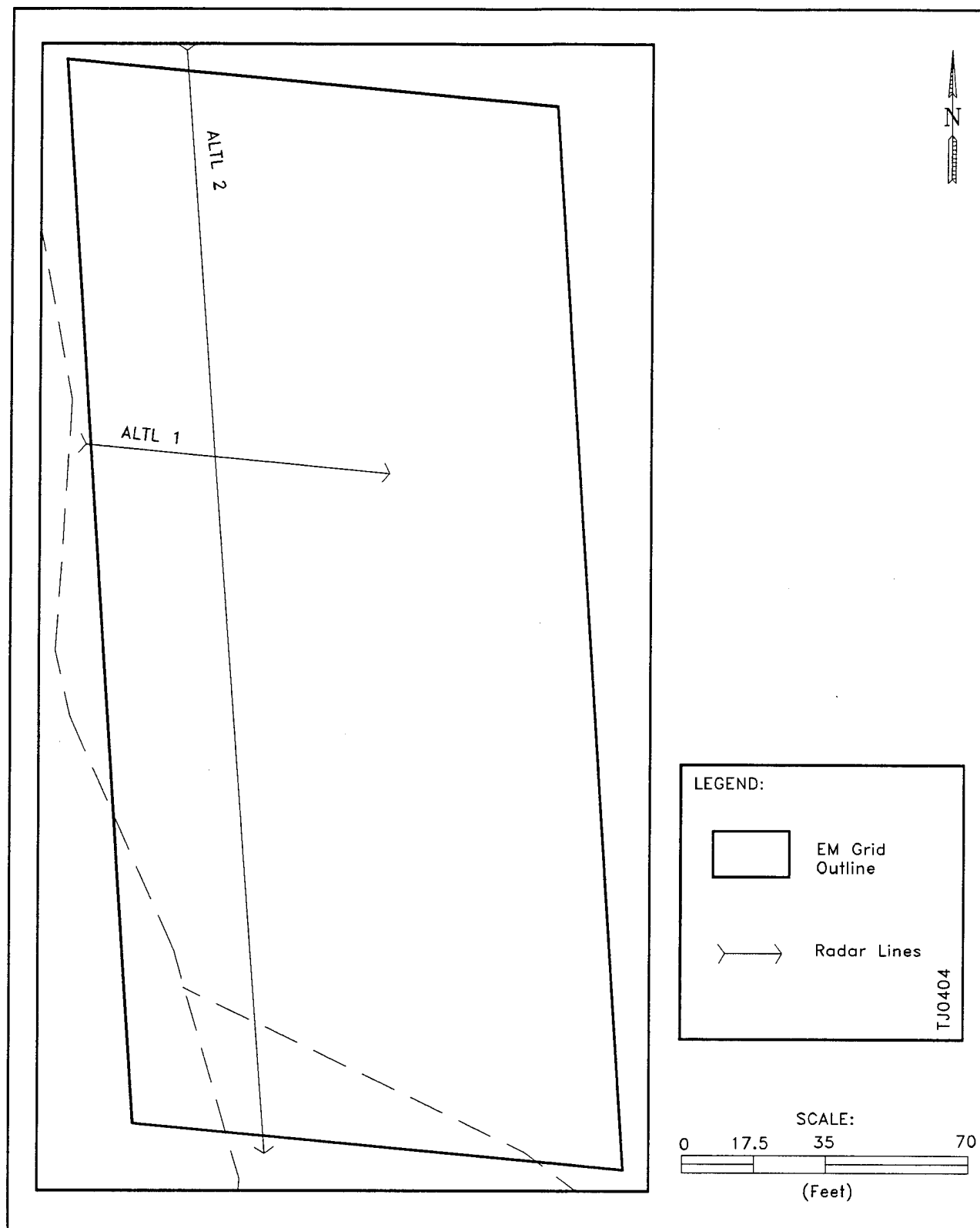


Figure 3-17. Outline of the EM Grid and Location of GPR Lines at the Alternate Landfill

## **Results**

The EM and GPR surveys identified several areas which potentially have buried metallic objects. Figures 3-18 and 3-19 are contour maps of the quadrature and in-phase data collected at the site. Two main areas of EM anomalies were defined by the surveys, one in the northeast corner of the grid (Area A) and the other across the southeast corner of the grid (Area B, Figure 3-18). These areas appear as the yellow to bluish shaded zones on the contour plots. The in-phase contour plot (Figure 3-19), which is more susceptible to metallic objects, confirms that the areas represent buried metallic objects and are not changes in ground conductivity as a result of disturbed soil. Metallic debris was evident on the surface over much of the ground in Area A and on the east side of Area B. Drums were also visible on the ground north of the north end of GPR line ALTL 2. The survey was successful in locating other metallic objects not visible on the surface. Metallic objects were not noted on the surface in the southern end of Area B, yet the EM detected several anomalies. In addition, several isolated anomalies appear more enhanced on the in-phase plot. These are labeled I1 through I5, and probably represent isolated bodies of buried metallic or metal-bearing objects.

Analysis of the GPR lines collected at the site (Figure 3-20) indicates that the depth of the Alternate Landfill is at approximately 100 ns (8 to 12 feet). The interpreted depth of the landfill is shown in the outlined area in Figure 3-20. Also shown on GPR line ALTL 2 is the interpreted depth of the landfill. The two anomalies on the south end of the line closely correspond to the zones of metallic objects observed on the EM contour plots. The anomaly between traces 100 and 140 does not appear to correspond to any obvious metallic objects and its origin is not clear.

### **3.4 Southwest Landfill Site**

The EM and GPR surveys were performed at the Southwest Landfill Site to determine areas of buried metallic objects (caches of drums, etc.) and, if possible, the areal

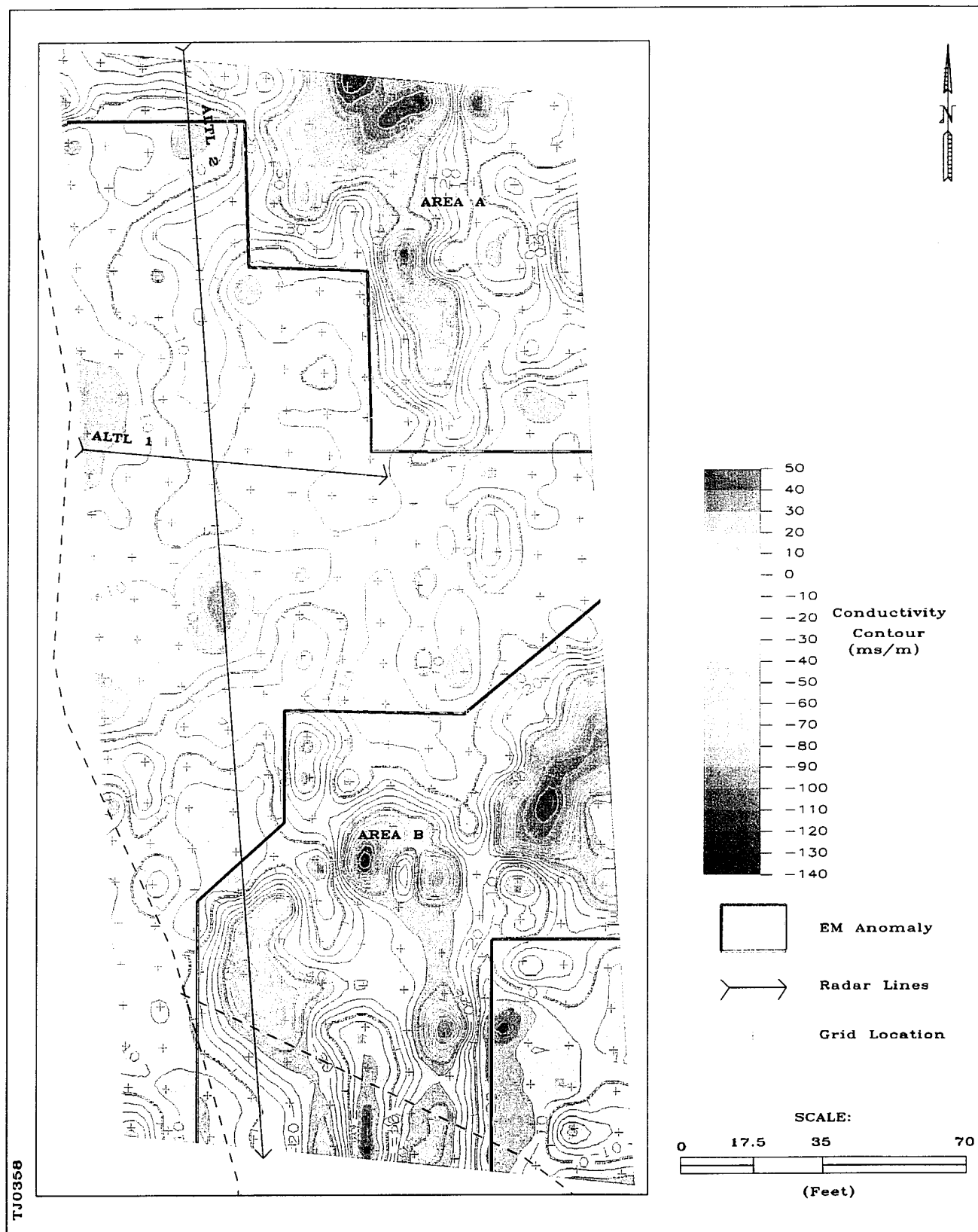


Figure 3-18. Contour Map of Quadrature EM Data  
Showing Locations of Anomalies

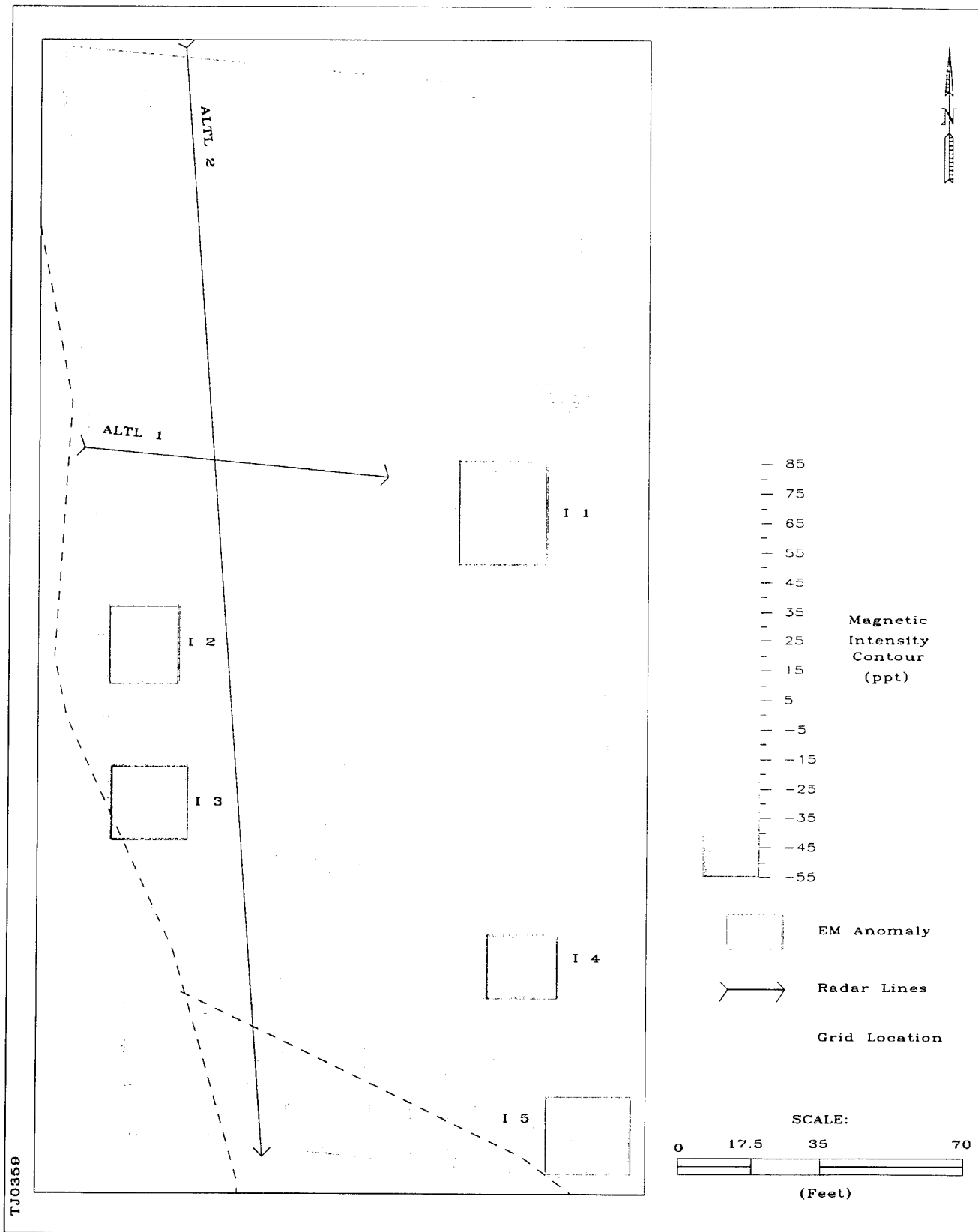


Figure 3-19. Contour Map of In-Phase EM Data  
Showing Locations of Isolated Anomalies



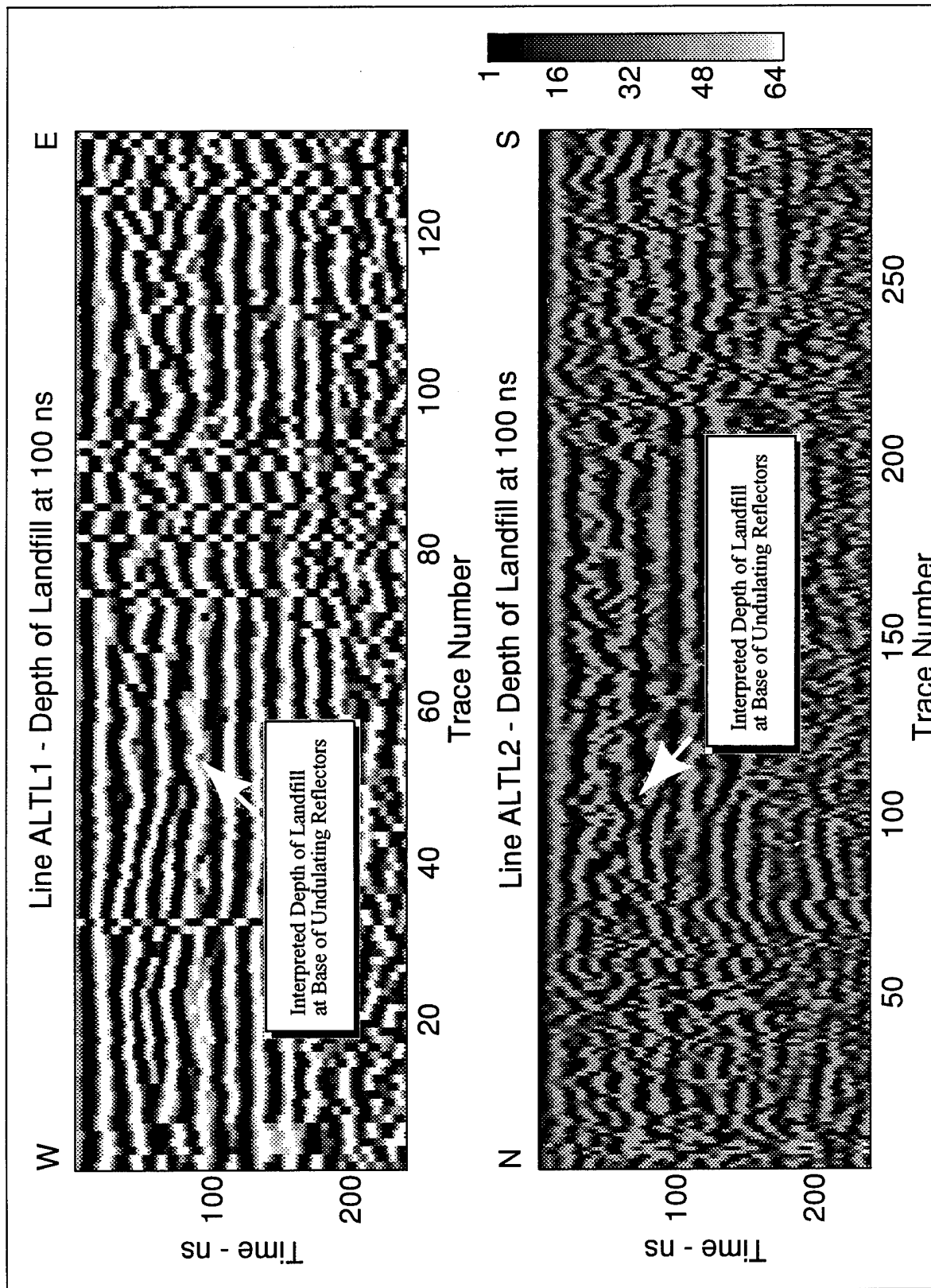


Figure 3-20. GPR Lines Showing Depth of Alternate Landfill

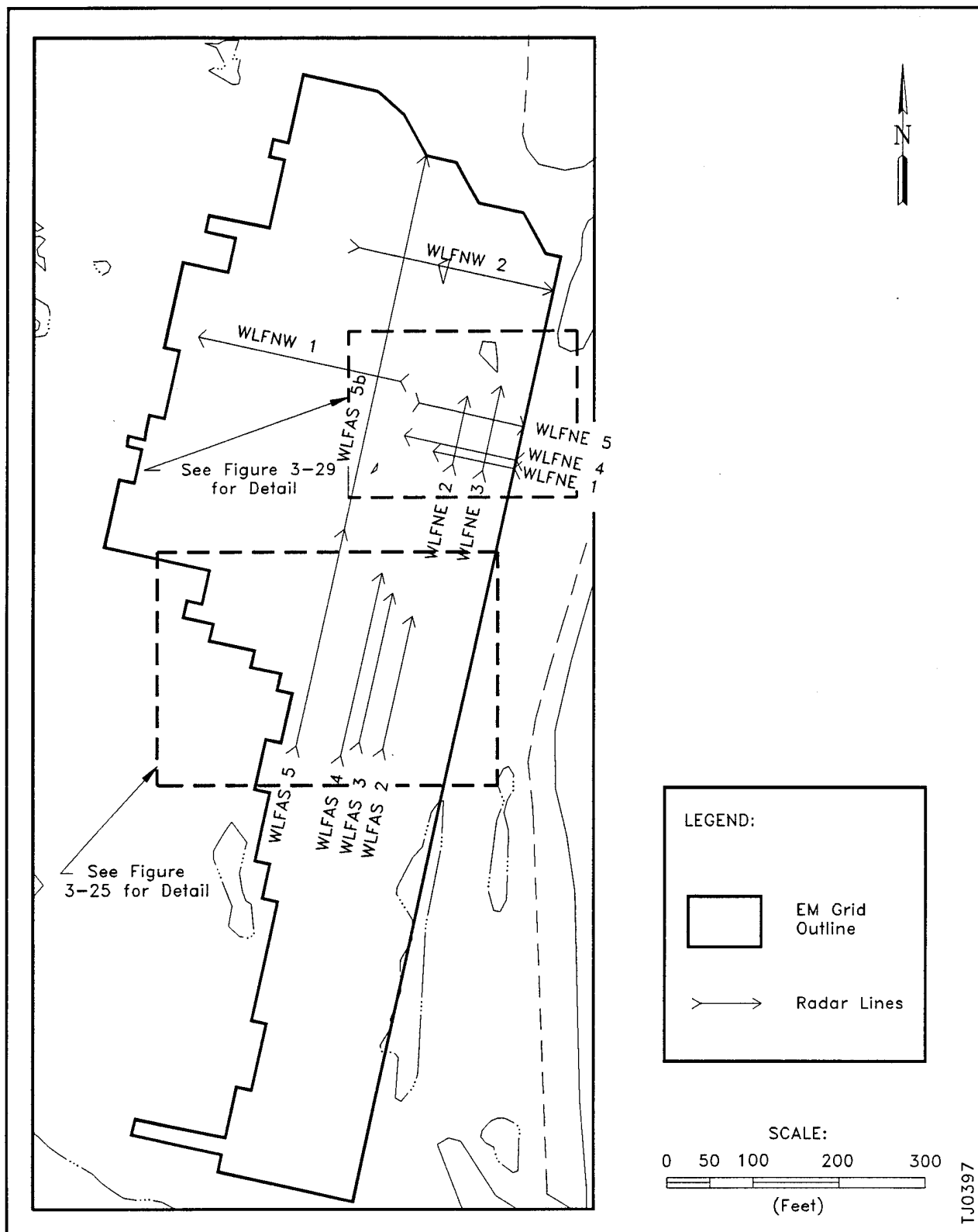
extent and the depth of any landfill debris. After review of aerial photographs and discussions with local base personnel, it was suspected that virtually the entire 8+ acre field west of the runway had been used for waste disposal, and at one time, asphalt manufacturing. It was decided in the field that the EM survey would be the most effective method of investigation and this method was used to cover the entire area of interest. The Southwest Landfill Site which was originally scoped for the EM survey was investigated by brief reconnaissance EM survey. No anomalies were detected and it was decided that a regular grid of data would not be collected at this location.

After a field review of the EM data collected during this survey, several GPR lines were collected to investigate the source and depth of the main anomalies detected using EM. Because of the size of the expanded area of investigation and the difficulty of access for the GPR equipment, it was not feasible to collect a regular grid of GPR data over the entire area.

#### **Data Grid and Data Collection**

Initially, a 1120-foot baseline was established along the east edge of the site, and survey markers were placed every 20 feet along the length of this line. Stations were established every 40 feet on the west edge of the site by taking a 90-degree bearing from the original baseline markers. The data were collected on a 20-foot x 20-foot grid by laying out ropes marked in 20-foot increments between the survey markers. Quadrature and in-phase data were taken in the vertical dipole position at the site. Several points around the grid were later surveyed to tie the data back to the basemap for the site.

GPR lines collected at the site were referenced to the survey stakes for the EM grid. Figure 3-21 shows the outline of the EM grid and the locations of the GPR lines.



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## Results

The EM-31 survey revealed five distinct anomalies in the ground conductivity readings. Figure 3-22 is a contour of the conductivity data for the site, with each of the separate areas outlined. Unlike the Alternate Landfill, metallic objects were rarely seen exposed on the surface at this site. Two anomalies in the upper part of the site (Area 6) are the result of an old concrete bunker and numerous 24-inch culvert pipes stacked at the end of the field. The anomalous readings are probably a result of rebar in the concrete. No large anomalies were detected in the southern half of the survey area. There is a gradual increase in background conductivity from the 10 to 20 millisiemen/meter (mS/m) range to the 20 to 25 mS/m range about 200 feet north of the southern edge of the site. It could not be determined from this geophysical investigation if this represents a natural fluctuation in the soil, or if this could potentially indicate a groundwater plume.

The in-phase contour map (Figure 3-23) indicates that most of the anomalies are either mostly or partially derived from metallic debris. The anomalies on this map are the same shape as on the conductivity map, but tend to pinpoint the individual areas of metallic waste. One anomaly that appears on the in-phase map (Area 7), but not on the conductivity map (as a result of the different contour interval), probably represents a single metallic object buried just under the surface. As previously stated, there are no major anomalies in the southern part of the site.

A total of 11 GPR profiles were collected. These covered parts of four of the five anomalous areas at the site. Four lines were collected in Area 1. Line WLFAS5 was continued as line WLFAS 5b north to the road. One line was collected across the major anomalies in area 3, and one line was collected across area 4. Both of these lines intersected line WLFAS 5. Five radar lines were collected in Area 5.

Figure 3-24 shows GPR lines WLFAS 2, WLFAS 3, and WLFAS 4, which were collected over the EM anomaly in Area 1 (Figure 3-25). All three lines show the

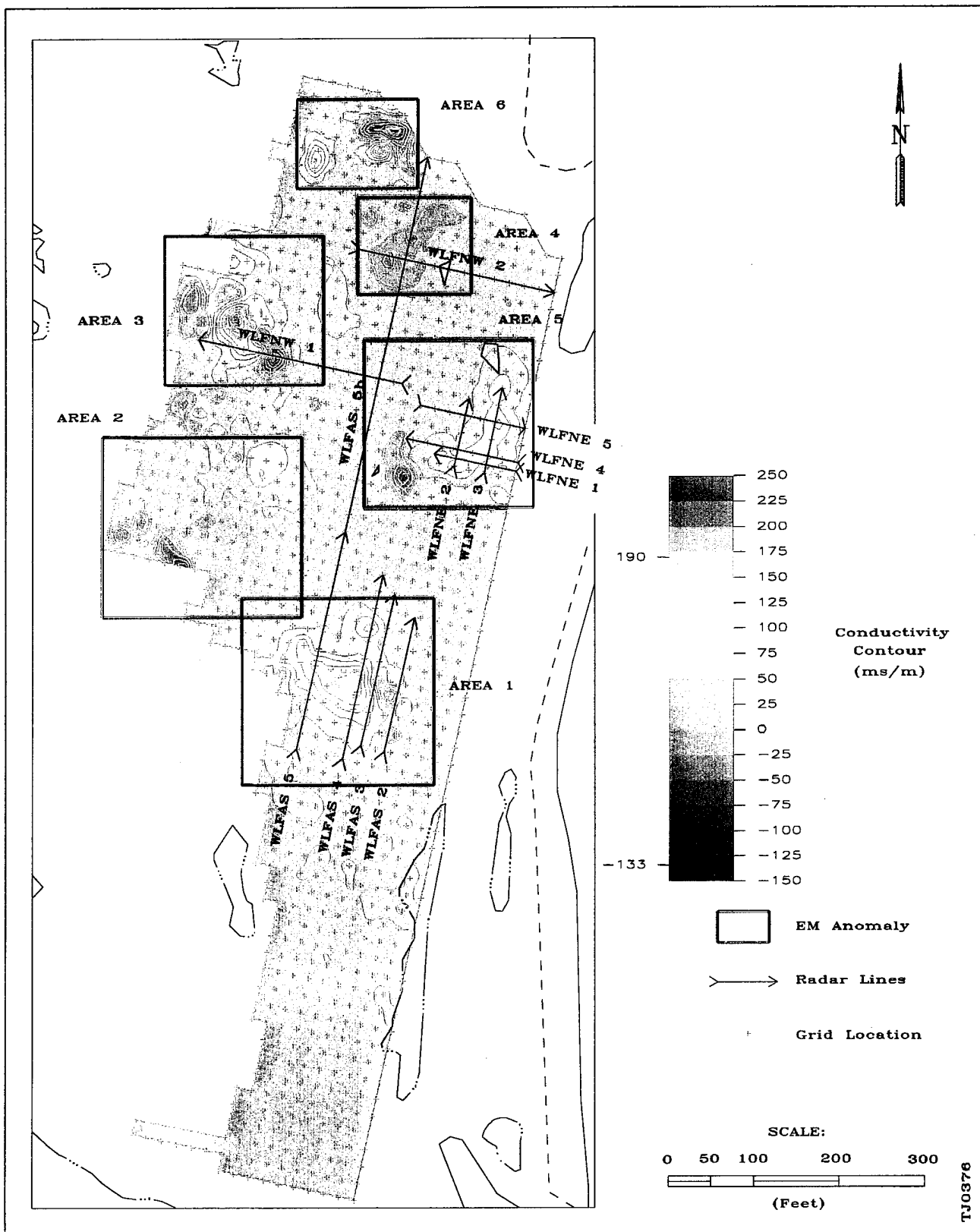


Figure 3-22. Conductivity Contour Map of the Southwest Landfill

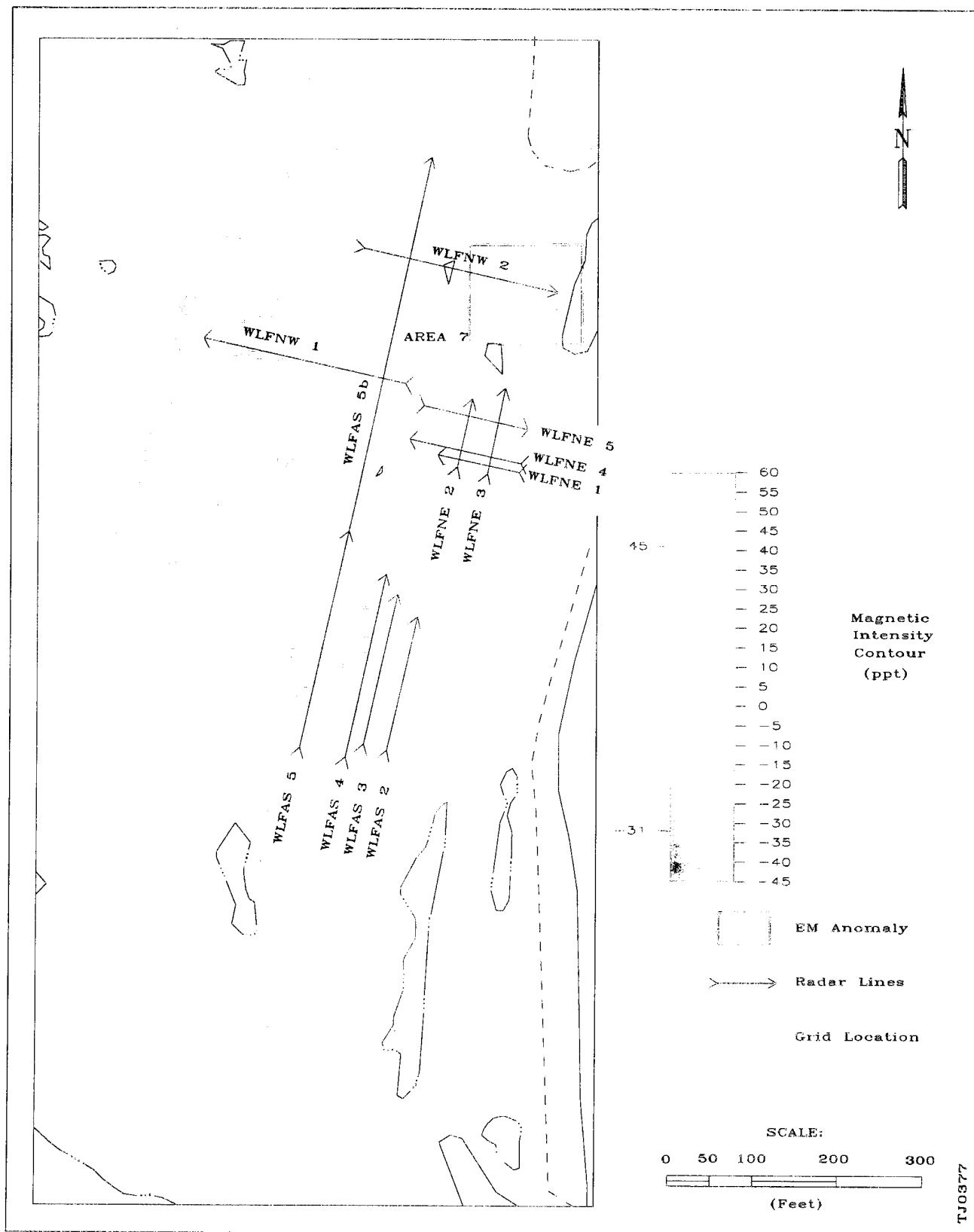


Figure 3-23. In-Phase Contour Map of the Southwest Landfill

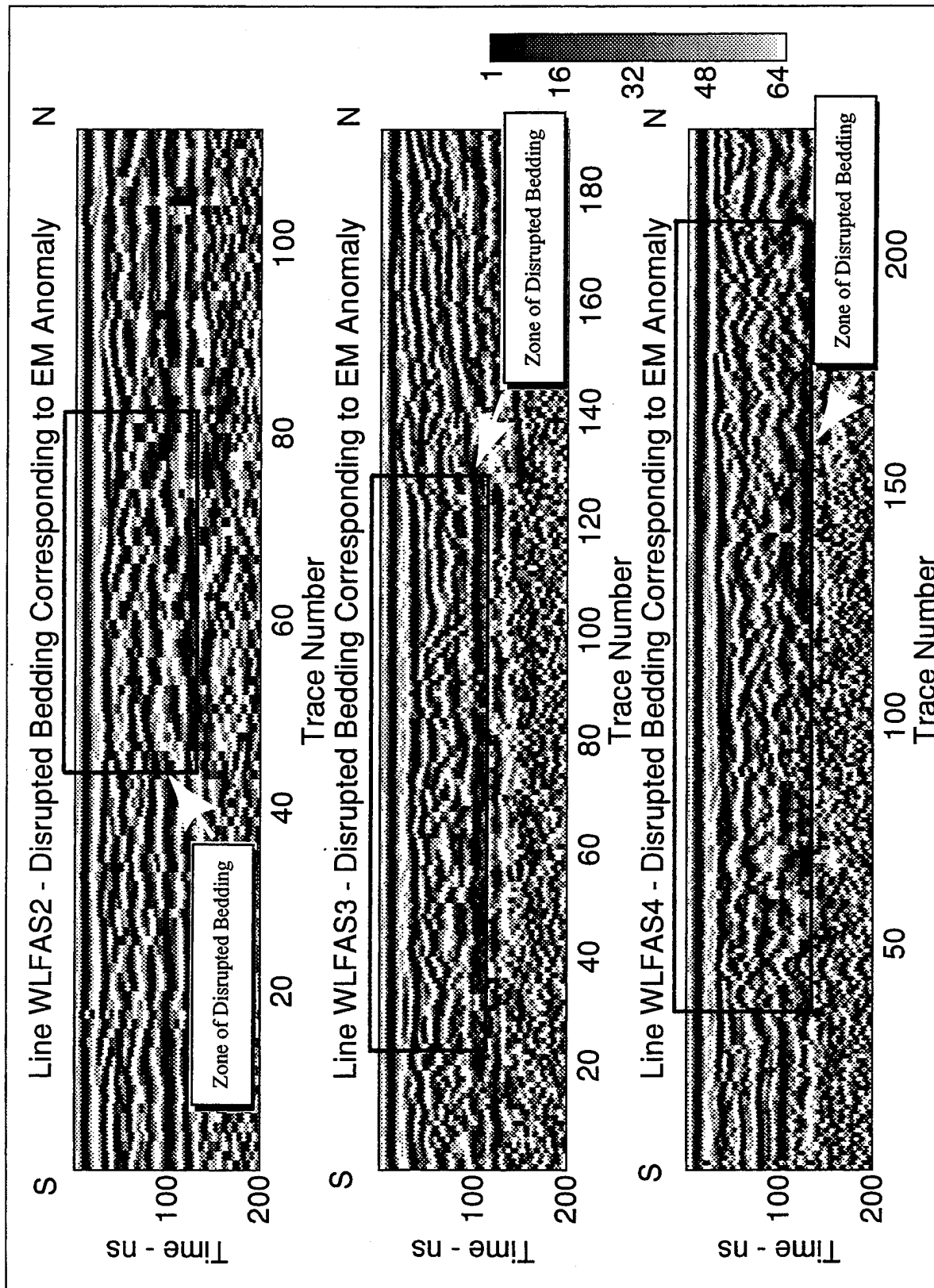


Figure 3-24. GPR Lines WLFAS2, WLFAS3, and WLFAS4 Showing Disrupted Bedding

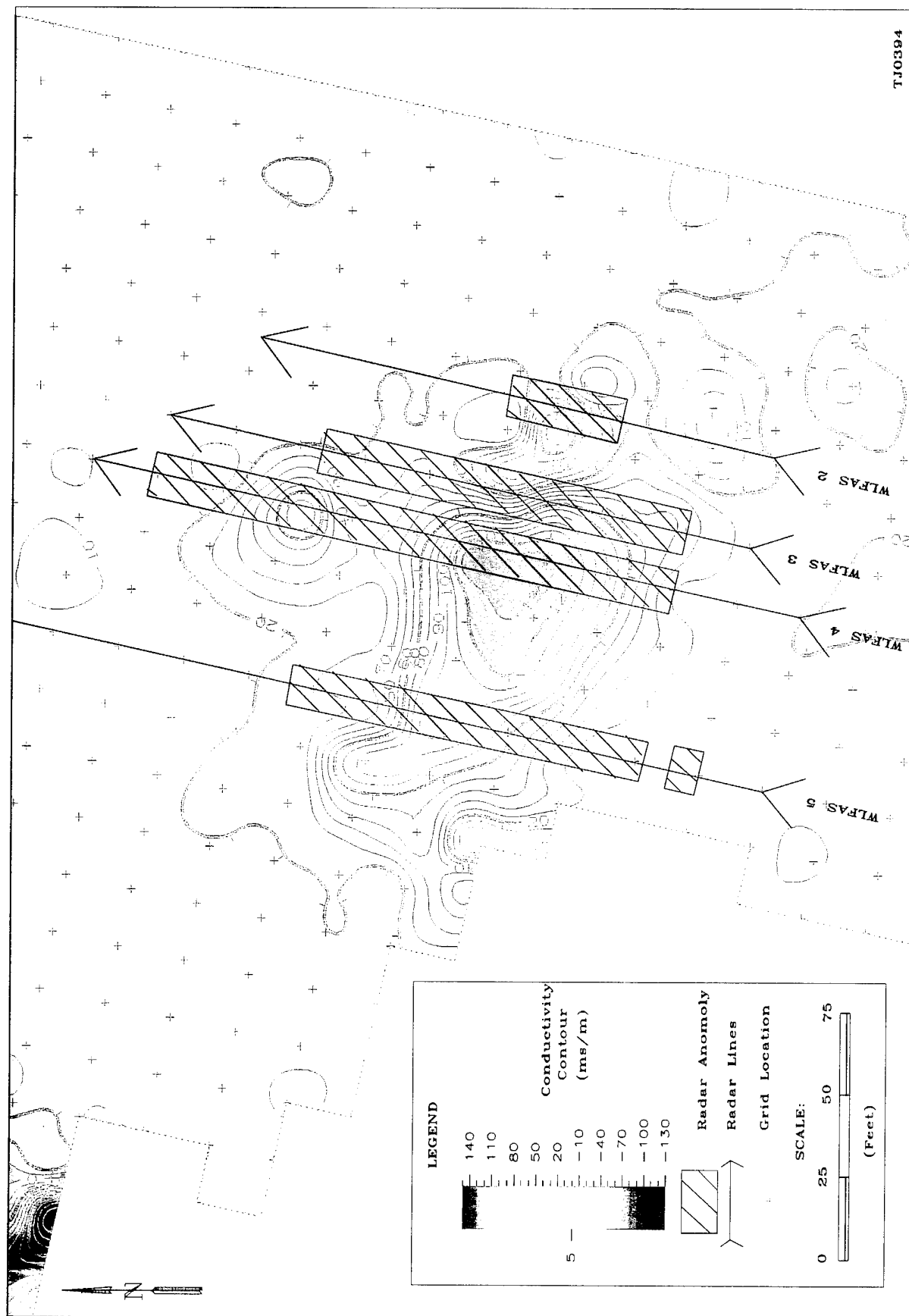


Figure 3-25. Enlarged Area from Figure 3-21 Showing GPR Anomalies



characteristic discontinuous reflectors and hummocky patterns above 100 ns (12 feet bgl)(see outlined areas), indicating disturbed soils or trenches. Reflectors in disturbed bedding generally show a lack of continuity and parabolic shapes resulting from diffractions of the radar wave off of the edge of the event. At the north end of Line WLFAS 3 at approximately 25 ns (6 feet bgl) to trace 140 at 100 ns (12 feet bgl), the reflectors are dipping down to the south. This could indicate the edge of a former trench.

Line WLFAS 5 (Figure 3-26) shows a localized anomaly at trace 30 at 50 ns (6 feet bgl). This anomaly was not detected with the EM and may represent a buried hollow, non-metallic object. Line WLFAS 5 also shows the disrupted bedding from trace 60 to trace 150 at 40 to 90 ns (4 to 10 feet bgl), and is probably indicative of trenches.

Line WLFNW1 runs over the top of the strongest EM anomaly in Area 3. The GPR data (Figure 3-27) indicate one anomalous zone from about trace 60 to trace 90, and strongly distorted reflectors from trace 150 to the end of the line. These distorted reflectors correspond to the areas where the EM data detected the presence of metal.

A strong anomaly is present on line WLFAS 5b at trace 260 and on line WLFNW 2 at trace 60 (Figure 3-28). This point is the approximate intersection of these two lines and corresponds with the EM anomaly in Area 4. The GPR data indicate that the source of this anomaly is just under the surface. Several small anomalies also appear on line WLFNW 2, as indicated by the discontinuous reflectors. These minor anomalies were not detected by the EM survey, and may be natural features in the soil stratigraphy.

The GPR lines collected in area 5 (Figure 3-29) clearly indicate the edges and depth of the pit that create this L-shaped anomaly. Figure 3-30 shows lines WLFNE 1 and WLFNE 4. On line WLFNE 1, a westward sloping reflector can be seen from trace 62, 10 ns (1.5 feet bgl) to trace 80, 80 ns (9 feet bgl). On line WLFNE4, The same event can be seen sloping from trace 80, 10 ns (1.5 feet bgl), to trace 90, 80 ns (9 feet bgl). This event

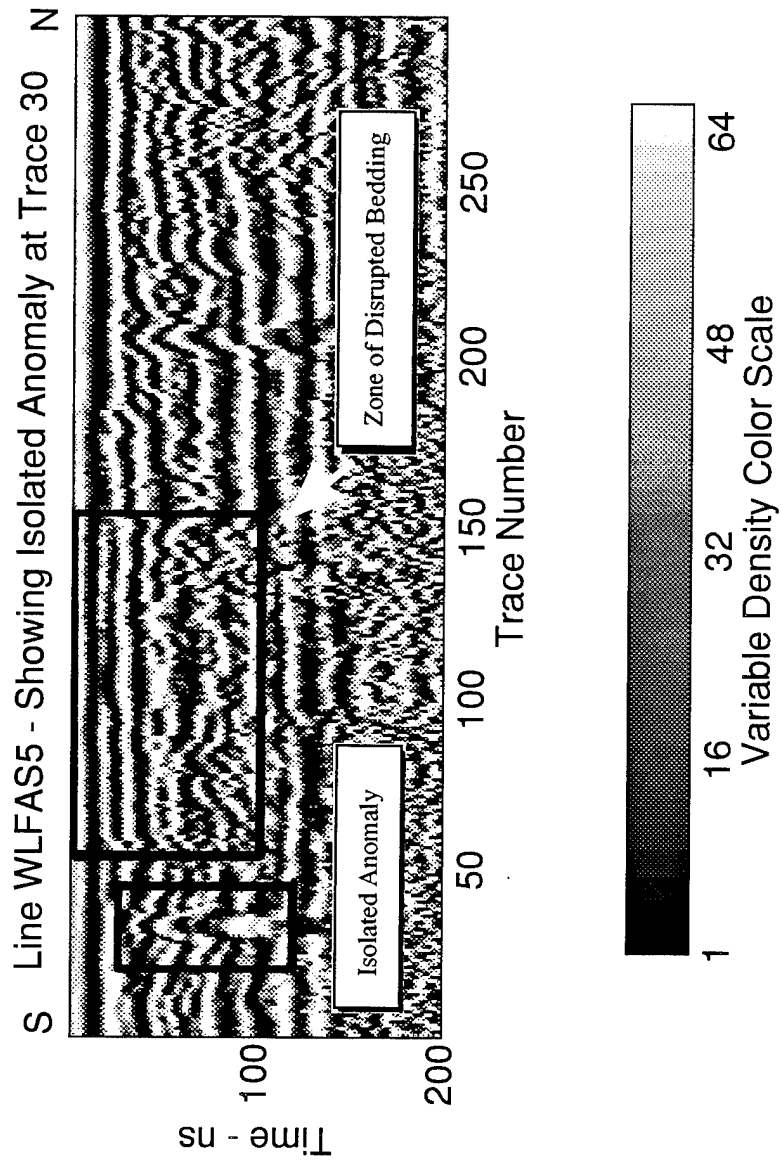


Figure 3-26. GPR Line WLFAS5 Showing Isolated Anomaly and Disrupted Bedding

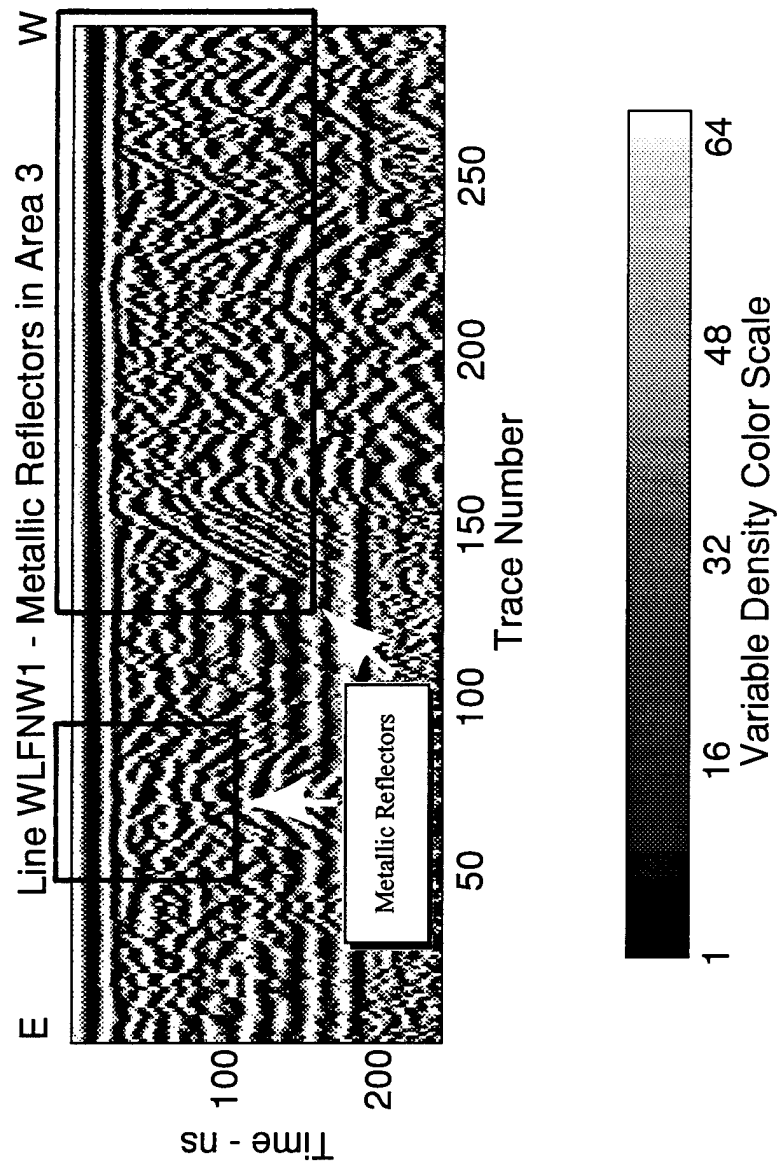


Figure 3-27. GPR Line WLFNW1 Over Anomalous Zone on the EM Data

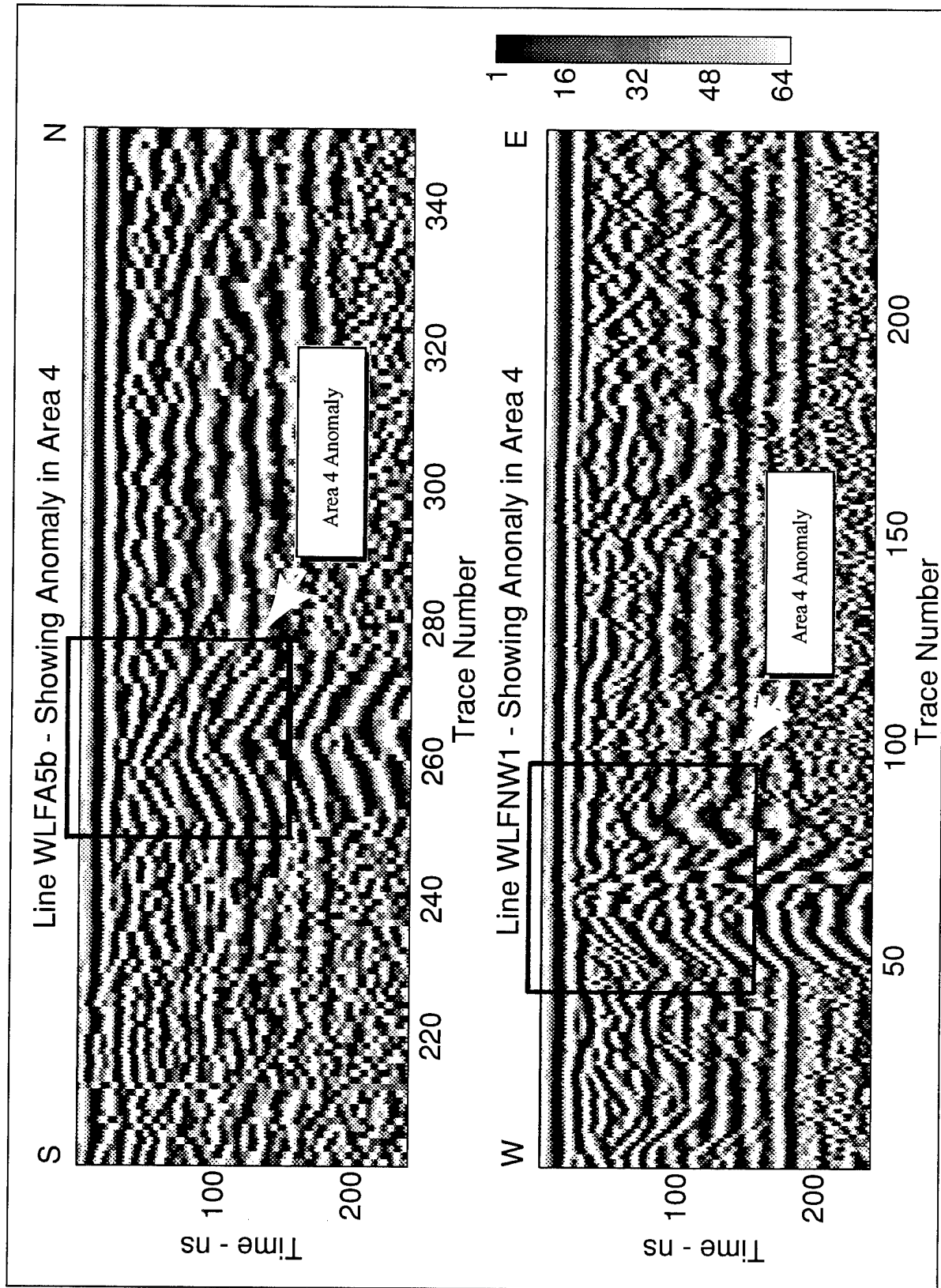


Figure 3-28. GPR Lines WLFAS5b and WLFNW2 Showing EM Anomaly in Area 4

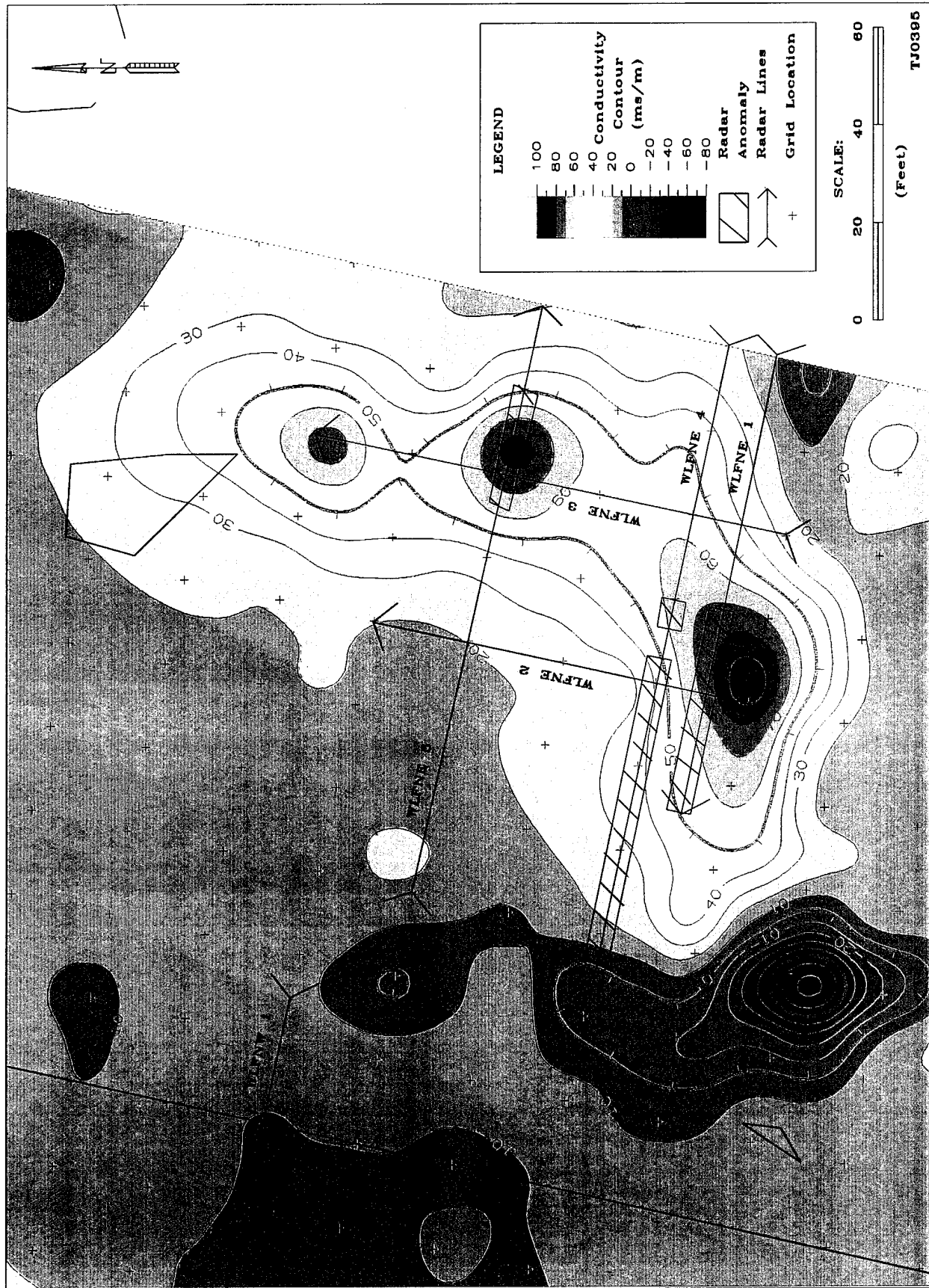


Figure 3-29. Enlarged Area from Figure 3-21 Showing GPR Anomalies

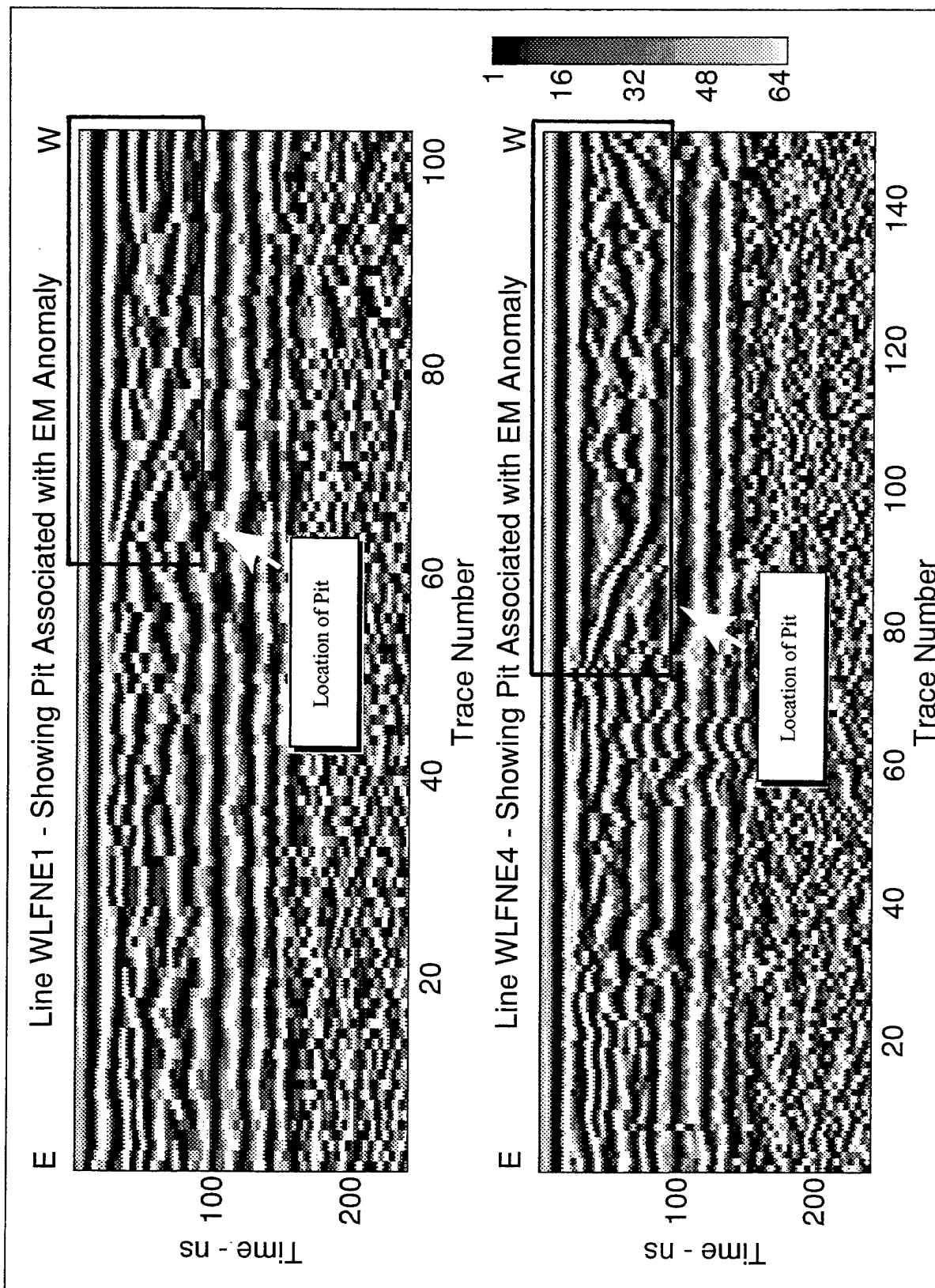


Figure 3-30. GPR Lines WLFNE1 and WLFNE4 Showing Trench

slopes back to the surface at trace 140, 80 ns (9 feet bgl) to the end of the line. The regular shape of this feature suggests that it is not a natural soil feature but is rather, a trench.

In Figure 3-31, Line WLFNE 5, the northern leg of the L-shaped anomaly can clearly be seen. Note the broken reflectors between trace 90 and trace 120 from about 40 to 80 ns (4 feet to 9 feet bgl). This zone corresponds to the anomaly detected by the EM survey. The GPR data here indicate that this part of the trench is on the order of 9 feet deep or less.

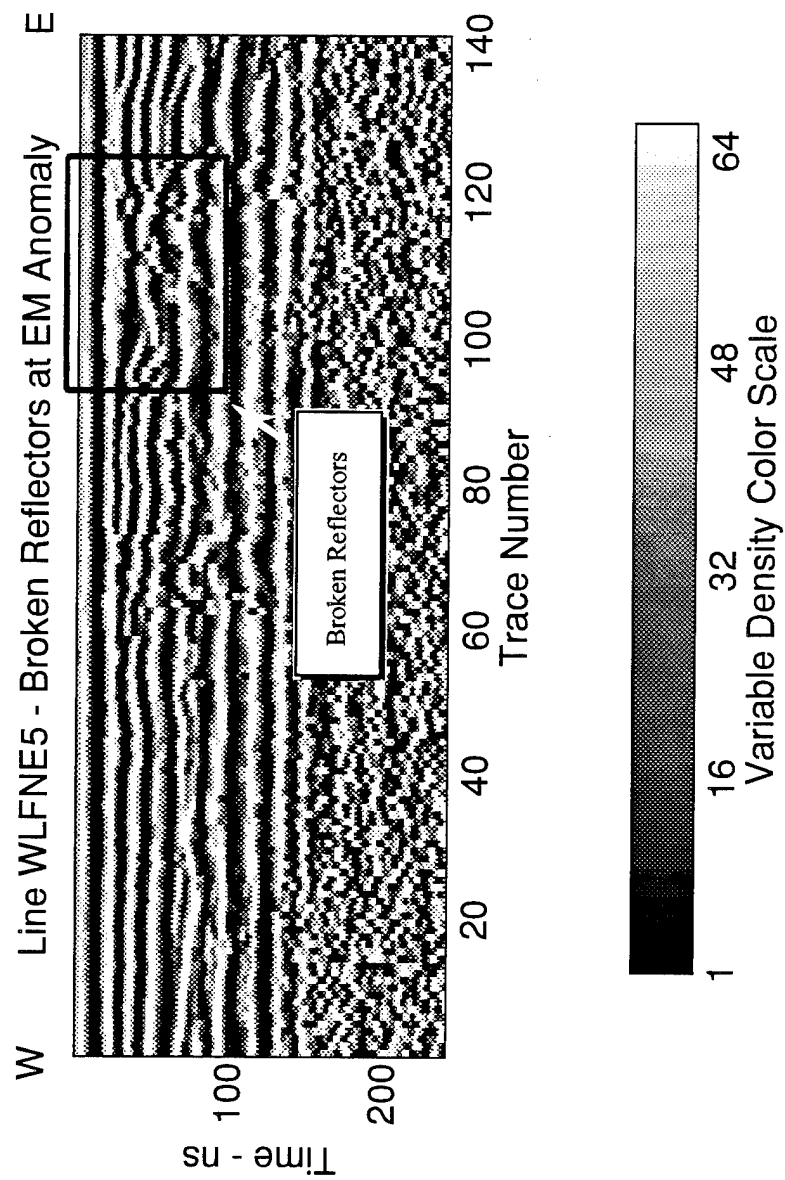


Figure 3-31. GPR Line WLFNE5 Showing Broken Reflectors Which Correspond to the EM Anomaly



It is apparent from the comparison of the results at the Ambient Site versus the FTA that shallow permafrost is detectable, and that it is not continuous at the FTA as it is at the Ambient site. The GPR data also provided a detailed depiction of the complex stratigraphy at the FTA, and this stratigraphic model may prove to have some bearing on the contaminant transport during high water periods.

The geophysical surveys at the landfill sites indicated that the combination of EM and ground penetrating radar can provide an effective means for determining the lateral extent and depth of areas of waste burial and proved effective for locating soil borings and wells for more detailed investigation. Comparisons of the results of the geophysical surveys and the field screening methods will be addressed in the Galena RI Report.

## 5.0

### Recommendations

Based on the success of the geophysical surveys at the landfill sites, it is recommended that a combination of EM and GPR surveys be carried out at all potential dumping sites at the Galena AFS prior to other field screening methods and the location of projected soil borings and monitoring wells. This data is useful for identifying areas of subsurface metal and disturbed soil and is also useful for defining subsurface stratigraphy. Because of the high conductivity of the groundwater, it is not recommended that GPR be used to detect permafrost which occurs below groundwater. Seismic refraction surveys might be better suited for this purpose.

**Soil Gas Investigation Report**

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## **1.0 SCOPE OF INVESTIGATION**

Several areas of groundwater contamination resulting from the release of fuels and/or chlorinated solvents have been identified at Galena Airport, Alaska. Soil gas investigations were conducted at these sites by Radian Corporation in the summer of 1993 to locate the downgradient extent of groundwater contamination and to aid in the positioning of proposed monitoring wells. This report presents the graphical results of these surveys in the form of concentration contour maps.

### **1.1 Site Screening**

The accompanying soil gas concentration contour maps illustrate the data collected through field screening activities conducted during the 1993 field season at Galena Airport, AK. Field screening was used as a tool to define the downgradient lateral extent of groundwater contamination at the following previously identified sites:

- FT01: Fire Protection Training Area #1 (FTA);
- ST05: North POL Area;
- ST05: South POL Area;
- ST09: Million Gallon Hill; and
- ST10: JP-4 Fillstands (previously referred to as the Proposed Vehicle Maintenance Building).

In addition to these sites, field screening was performed at the area surrounding Building 1845, the existing Vehicle Maintenance Building. The purpose of the screening in this area was to locate the most probable source of the TCE that was detected in the groundwater collected from monitoring well 06-MW-01.

The soil gas screening task was executed in two phases. During the first phase, grid delineation, the field team established a 100-ft square grid across each site using a Leitz Set 4A EDM Total Station with a Sokkia reflecting prism and prepared site maps.

Grid nodes were assigned number/letter designations (e.g. B-3, A-2, G-5, etc.), and marked with surveyor's flags, hubs, or spray paint. Some of the points however, were moved several feet from proposed grid nodes to allow for easier sampling (by minimizing sampling through concrete and asphalt), to avoid building foundation fill material, and to accommodate utility clearances. The final soil gas contour maps show the exact location of all sampling points.

The second phase of site screening consisted of collecting soil gas data using portable photoionization (PID) and flame ionization (FID) detectors. Soil gas samples were initially collected using an Arts Manufacturing and Supply (AMS) soil vapor probe. However, after several occurrences of equipment failure, the AMS equipment was replaced by a new, more robust Geoprobe System, that could withstand the physical demands required to sample soil gas at Galena Airport. The following list describes the method used to collect soil gas data:

1. The sampling point was located and identified using base maps and field notes from grid delineation.
2. The PID and FID were attached to a section of teflon® tubing, an adapter, and clean drive-tip. A background measurement was recorded to assess the cleanliness of the sampling train prior to sample collection. If measurable organic vapor was detected during the background screening, the tip and adapter were recleaned and attached to new teflon® tubing.
3. The tip was attached to the drive tubes and the soil vapor probe was driven to the desired depth (6 to 8 feet below ground level) using a hand operated, electric, rotary hammer drill.
4. The teflon® tubing and adapter were lowered through the vapor probe drive tubing, and screwed onto the drive tip.
5. Using a jack, the drive tubes were extracted several inches to extend and release the retractable drive tip.

6. The PID and FID were attached directly to the teflon® tubing and the instrument's internal pumps were used to draw the soil gas sample through the PID and FID. The maximum peak detected by each instrument was recorded at each sampling location. If the volume of organic vapors present in the soil gas exceeded the upper limits of the analytical equipment or if the flame in the FID was extinguished due to low oxygen concentrations in the soils, the highest recorded value was logged in the field notebook and flagged with a plus sign (+). This was used to indicate that the recorded value may be biased low. All data from the soil gas analysis (time, depth, background air, background tube/tip, PID reading, FID reading, and comments) were recorded in the field logbook.
7. After collection of the soil gas sample, the tubing was removed and the drive tubes were extracted from the soil using a hand operated jack. Following extraction, the retractable tip and the lead drive tube (if contaminated) was decontaminated.

## **1.2 Soil Gas Data Analysis**

In general, the trends identified from the results of both the PID and FID analysis of the soil vapors were similar. However, the PID results were used to graphically represent the contamination at most sites. FID measurements were less reliable and more sporadic due to frequent flame-outs caused by low oxygen content in the vadose zone. The results of the soil gas surveys were contoured using the Radian contouring software CPS3®. The contours reflect total volatile organic vapors detected by photoionization and were generated using data collected from sampling soil vapor 6 to 8 feet below ground level.

## **2.0 DATA RESULTS**

### **2.1 FT01: Fire Protection Training Area (FTA)**

The soil gas survey at FT01 was performed to determine the downgradient extent of the benzene plume that extended past the southernmost well, 01-MW-01. Soil gas samples were collected at 26 sampling points across the site. Figure 2-1 shows the concentration of organic vapors in soil gas as measured by an FID. As shown in the figure, two areas of hydrocarbon contamination were detected by the FID analysis. The PID instrument did not detect the high level of organic vapor observed in the southern portion of the site. Field notes suggest that the PID may have malfunctioned after exposure to rain water and therefore, this data was not used to generate contours.

The area of contamination in the northern portion of the site corresponds to the soil and groundwater contamination previously identified by soil and groundwater sampling during the 1992 field investigation. The source of the contamination is thought to be the release of fuels within the burn pit during fire protection training exercises. The results of the soil gas survey were used in conjunction with groundwater flow direction calculations to locate a new downgradient monitoring well.

During the soil gas survey a second area of contamination was detected approximately 300 feet south of the burn pit. This area is topographically higher than the burn pit and located hydrologically side/down gradient. The source of the organic contamination is unclear. However, a pipe and valve used for the transfer of fuels was discovered sticking out of the ground when the high grass vegetating the area was mowed in preparation of the soil gas and geophysical surveys. It is possible that during fire protection training exercises, fuel was fed to the burning mock-up within the burn pit via an underground pipe. Spills may have occurred in conjunction with these activities. A monitoring well was installed in the area of observed soil contamination to confirm the



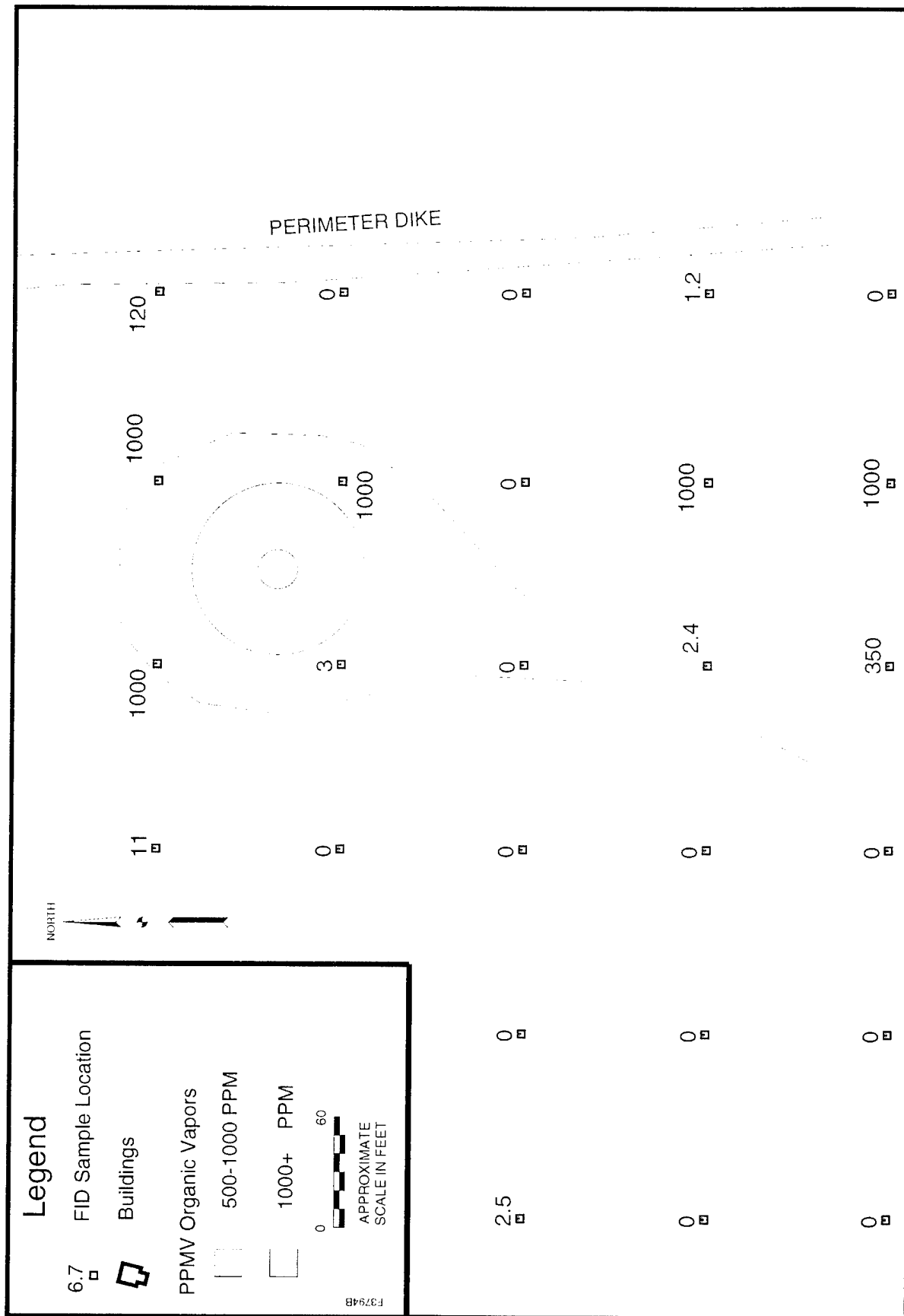


Figure 2-1 Concentration contour map of FID detectable organic vapors in soil gas at the Fire Protection Training Area (FT01), Galena Airport, AK

presence or absence of hydrocarbon contamination in groundwater from this newly identified probable source area.

## **2.2 ST05: North POL Area**

The purpose of site screening at the POL North was to define the downgradient extent of BTEX contamination in the groundwater that was originally identified at monitoring well 05-MW-11 during the Stage 3 Remedial Investigation. A grid was established across a 600' by 500' plot surrounding 05-MW-11. Figure 2-2 illustrates the results of the soil gas survey as measured at 39 sampling points.

The low concentration of organic vapors noted in the southeastern portion of the site is related to the contamination in the southern POL and is discussed in Section 2.3. The central area of contamination that extends from the MOGAS and AVGAS valve rack to the southwest reflects soil and groundwater contamination that originated from spill/releases at the valve rack. This corresponds to the groundwater contamination that was observed in monitoring well 05-MW-11 during the 1992 field season. The southwesterly trend in the contaminant plume, as defined by soil gas analysis, correlates well to the observed groundwater flow direction at the site. Based on the results of the soil gas survey and calculated groundwater flow direction, a downgradient monitoring well was installed southwest of the observed plume.

The two areas of elevated organic vapors detected in the northwest portion of the site may be related. These areas correspond to the former location of abandoned fuel tanks and fillstands that were removed prior to the construction of Building 1872. A soil gas sample collected from the area between the two wings of Building 1872 contained no measurable hydrocarbons. However, the sample could have been collected in clean fill material that replaced potentially contaminated soil after excavation and construction.

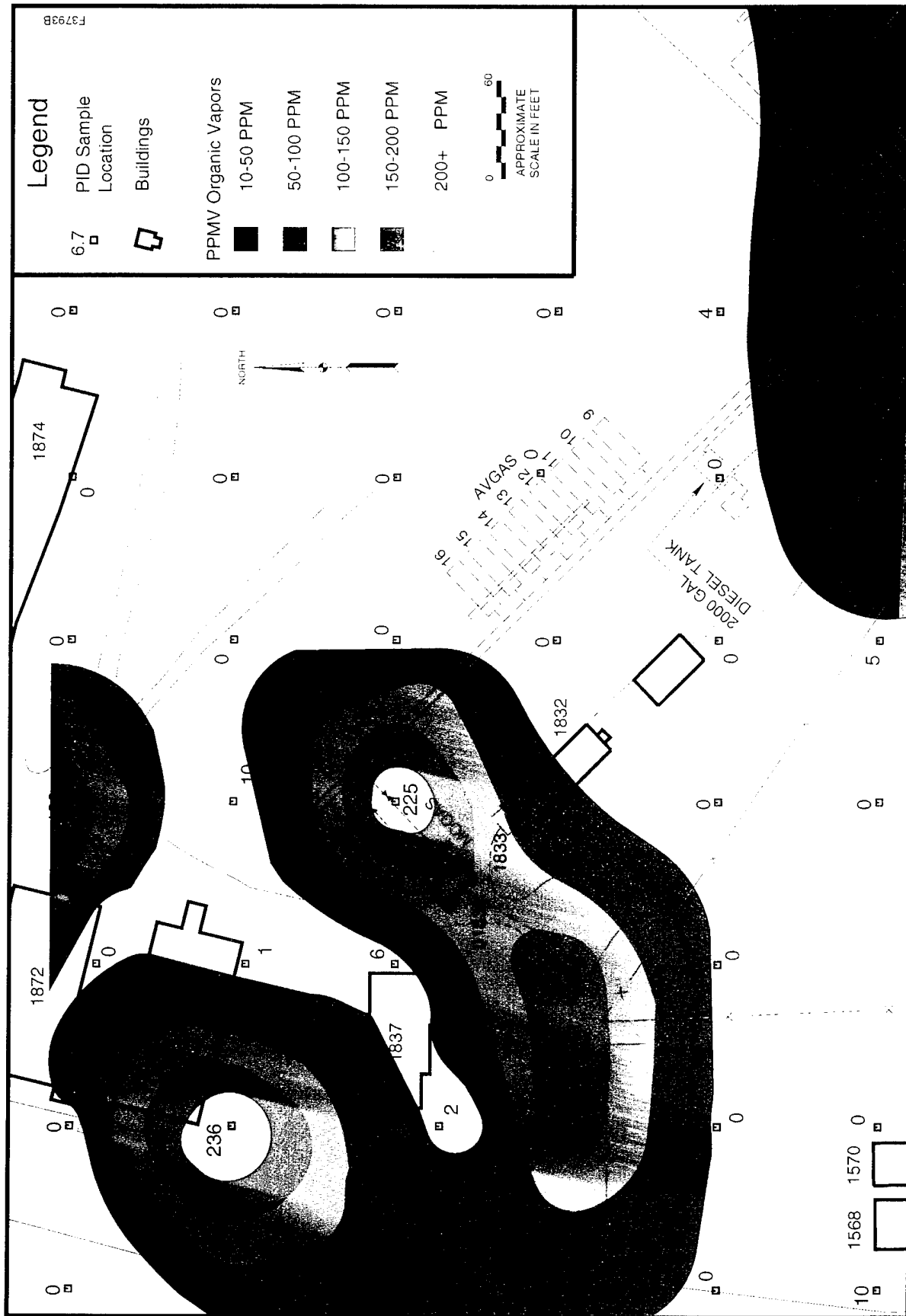


Figure 2-2 Concentration contour map of PID detectable organic vapors in soil gas at the North POL Area (ST05), Galena Airport, AK

Two soil borings were completed and sampled within this area of contamination to confirm and quantify the hydrocarbon content of the soils.

### **2.3 ST05: South POL Area**

Groundwater contamination from the spill/release of fuels in the South POL area was identified by Woodward Clyde Consultants (WCC) and investigated by Radian during the summer of 1992. Free phase floating product (LNAPL) and high levels of dissolved benzene were identified in the downgradient monitoring well at the site. A soil gas survey was conducted across the site to define the downgradient extent of the dissolved hydrocarbon contamination observed in the monitoring wells. Thirty-one soil gas samples were collected and used to create the contour map presented in Figure 2-3.

Three areas of potential contamination can be identified on the soil gas map. They include: 1) the area west of Building 1556, 2) the area north of the Mark Air Building, and 3) the area south of the MOGAS tanks. The source of the organic vapors detected in the area to the west of Building 1556, the Galena Airport Fire Station, is uncertain. A diesel fillstand was located approximately 100 feet west of the sampling point but was removed prior to the installation of the fillstands at site ST10. The low levels of organic compounds detected in the soil gas may be the results of historical spills that occurred at the fillstands.

The isolated area of organic contamination detected north of the Mark Air Services Building is also of uncertain origin. The area occurs in the vicinity of a JP-4 and diesel pipeline that crosses the site. However, there have been no reported releases of fuels from the pipelines in this area.

The large area of hydrocarbon contamination that extends from the POL Tank Farm to the flight service buildings is easily recognized in Figure 2-3. The soil gas results suggest the occurrence of two lobes of contamination indicating multiple source

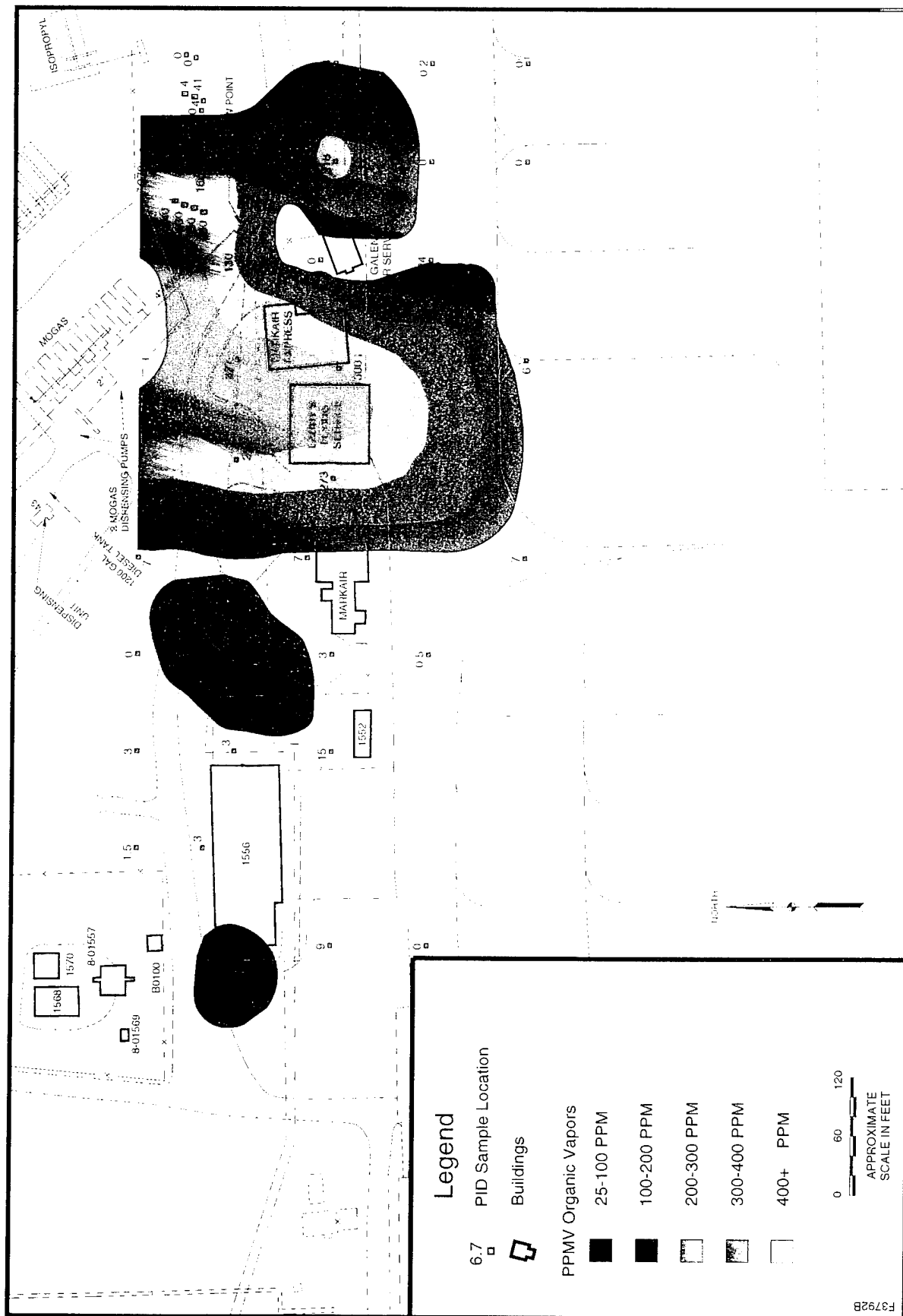


Figure 2-3 Concentration contour map of PID detectable organic vapors in soil gas at the South POL Area (ST05), Galena Airport, AK

areas. The western plume extend below Larry's Flying Service and the Mark Air Express building. The eastern plume occurs in the area east of the Galena Air Service building. Both contaminant plumes exhibit a southerly trend which is consistent with computed groundwater flow directions at the site.

The trends observed in the area of the flight services buildings are similar to the trends defined by the 11<sup>th</sup> CEOS during their soil gas analysis. Since soil gas samples collected by the 11<sup>th</sup> CEOS were analyzed for BTEX constituents, the results of their analysis cannot be directly compared to measurements of total organic compounds detectably by photoionization. Therefore, the 11<sup>th</sup> CEOS data was not included in the soil gas map shown on Figure 2-3. However, the trends defined by both investigations can be compared. The data from the 11<sup>th</sup> CEOS also indicate the presence of two lobes of contamination that extend in a southerly direction. The two lobes extend below Larry's Flying Service and the area between Mark Air Express and Galena Air Service and combined, cover the same area as the large western plume identified by Radian. This difference in the precise location of the plume is the result of sample placement and sampling density. The information gathered by the 11<sup>th</sup> CEOS is more tightly clustered around the flight service buildings providing higher resolution and more accurate definition of contaminant extent. The eastern plume that was defined by Radian is not apparent from the 11<sup>th</sup> CEOS data. No sampling points, however, were installed by the 11<sup>th</sup> CEOS east of the Galena Air Service building.

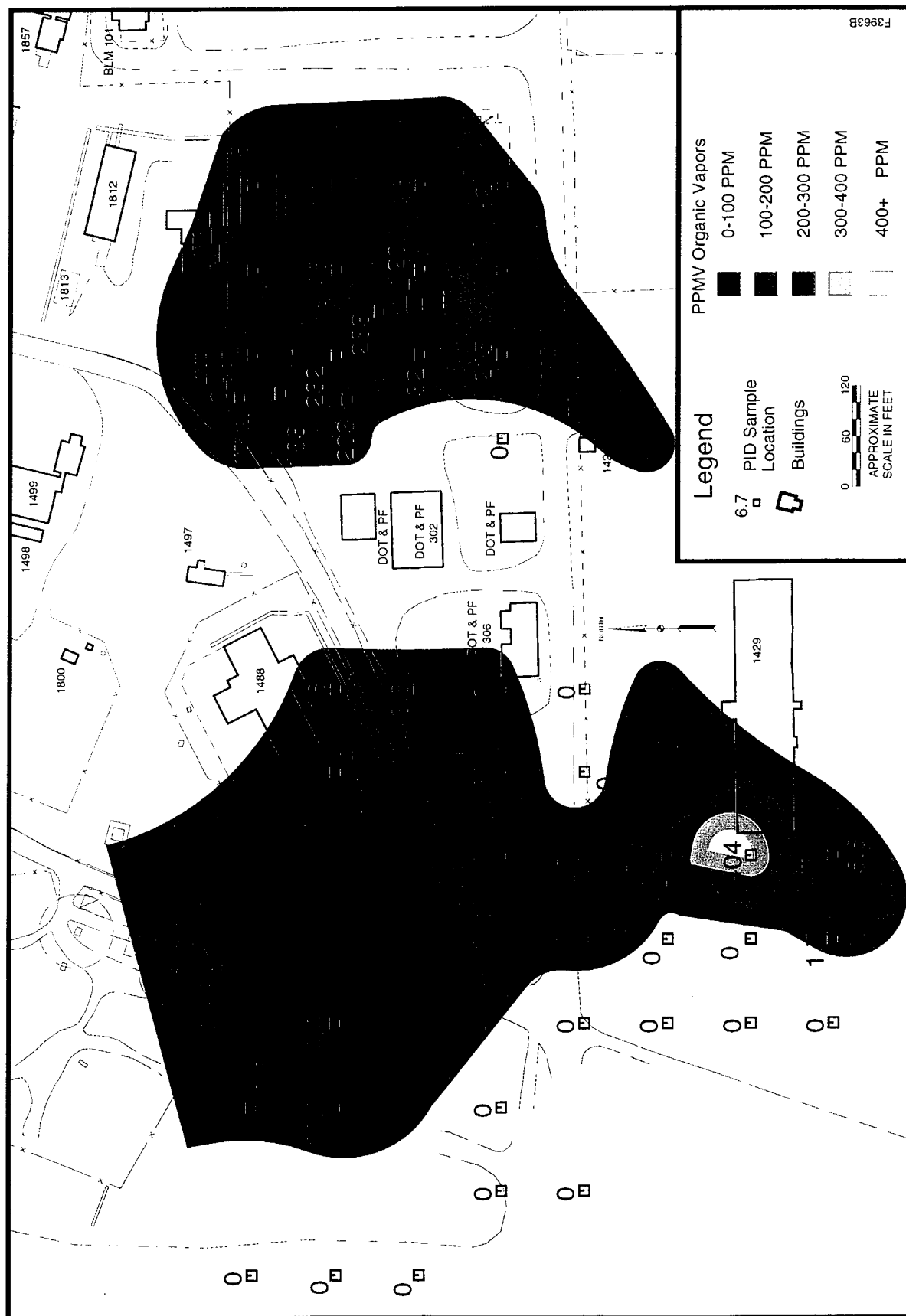
Based on the results of the soil gas survey, two monitoring wells were located and installed south of the POL. One well was located in the area south of the main western plume and one was located south of the Galena Air Services building.

## 2.4 ST09: Million Gallon Hill

Field screening for Million Gallon Hill was conducted to determine the downgradient extent of known hydrocarbon contamination resulting from past spill/releases from UST Nos. 37 and 38. Contamination from petroleum hydrocarbons was detected in soil and groundwater during the 1993 field season, appearing to have originated in the fuel storage facility, with free product detected in 09-MW-08, 09-MW-12, and 06-MW-04. The purpose of defining the downgradient extent was to aid in the placement of monitoring wells outside the contaminant plume.

A grid was established south and east of the fuel storage area, extending south of the CAC hangar. A total of 33 soil gas samples were collected and analyzed using both PID and FID. Many of the proposed sampling locations directly southeast of the large USTs were in deep brush and were inaccessible. Low oxygen levels in the fairly tight soil also prevented the collection of FID data from a majority of the sampling points. Moreover, soil gas samples taken in areas where free product was known to exist contained only slightly elevated hydrocarbon concentrations as detected by the PID. The hydrocarbon contaminant present may be either aging diesel or newer JP-8 which contain very low levels of volatile constituents. This would explain the difficulty experienced detecting soil and groundwater contamination via the soil gas survey.

The data from PID analysis of soil gas was used to generate the western portion of the soil gas map presented in Figure 2-4. In general, the measurable organic vapor from the contamination migrating from Million Gallon Hill was less than 20 ppmv. This was substantially less than the level of contamination observed at other sites. The JP-4 Fillstand Site, for comparison, is shown on the eastern portion of Figure 2-4 and contains up to 283 ppmv organic vapor.





High levels of organic contamination was detected in a small area west of Building 1429, the CAC hangar. The source contaminant at this site contains significantly more volatile constituents than the hydrocarbons responsible for the contamination originating from Million Gallon Hill. This isolated occurrence of high levels of organic vapor could be a result of surface spills on the tarmac area, historic leaks from the CAC UST located in the general area, or the spill/leak of fuels from bowzers or other mobile fuel storage tanks were stored in this area. A soil boring was completed and sampled in this area. Based on the results of the screening activities, a downgradient monitoring well was installed south of the contaminant plume.

## **2.5 ST10: JP-4 Fillstands (formerly Proposed Vehicle Maintenance Building)**

The investigation around the JP-4 fillstands, or Proposed Vehicle Maintenance Building, was directed to find the source and lateral extent of groundwater contamination which was identified during the 1992 field season. Twenty-one soil gas samples were taken throughout the fillstand area and tarmac. The results from PID analysis of the soil gas samples were used to generate the contoured data on the eastern portion of Figure 2-4.

Based on the soil gas results, two soil borings were placed in the fillstand area to document the lateral and vertical extent of the soil contamination. Also using the results of the soil gas survey and groundwater flow calculations, a monitoring well was placed approximately 100 ft. east of the CAC hangar to document the extent of contaminant migration.

## **2.6 Building 1845 (Existing Vehicle Maintenance Building) Spill Site**

The existing Vehicle Maintenance Building Area was targeted for soil gas screening to identify the source of TCE detected in groundwater collected from

06-MW-01 during the 1992 field investigation. It was believed that Building 1845, the Vehicle Maintenance Building, was the most probable source of the TCE. A total of 23 soil gas were sampled and analyzed with PID and FID. The contours shown in Figure 2-5 illustrate the contaminant plumes identified during the survey.

During the survey, a previously unidentified area of concern was discovered near the southwest corner of Building 1700. This building has been used for the maintenance of the airplane refueling trucks. The elevated hydrocarbon readings may be the result of fuel spills or releases associated with maintenance activities that occurred in Building 1700. Preliminary results from soil samples collected from a soil boring placed near the southwest corner of the building indicate that the soils are contaminated with BTEX constituents, probably originating as fuels, and not from the release of chlorinated solvents. Unfortunately, the analytical equipment used in the soil gas survey, PID and FID, were unable to differentiate between the two plumes consisting of TCE and fuel contamination.

The area of contamination that occurs south of Buildings 1845 and 1342 is the result of TCE contamination. Due to limited low density sampling between these two buildings, it is difficult to pinpoint the exact spill/leak location. However, the results do suggest that the upgradient extent of the plume does not extend north of Building 1847. Based on the results of the soil gas survey, a monitoring well was installed north of Building 1847 to document the upgradient extent of contamination.

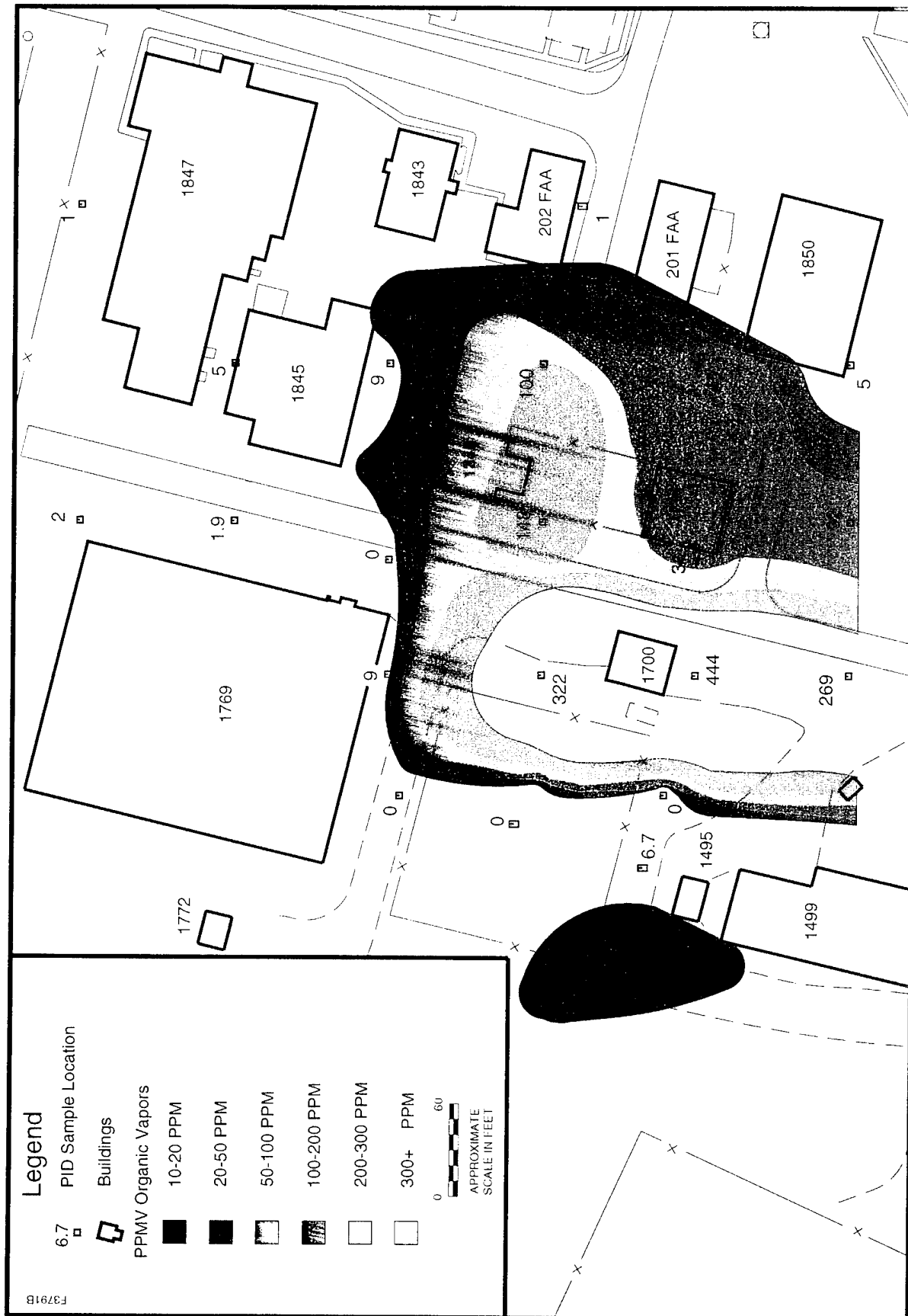


Figure 2-5 Concentration contour map of PID detectable organic vapors in soil gas at Building 1845, Vehicle Maintenance Building, Galena Airport, AK

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